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Biographia Philosophica.

BEING

An ACCOUNT

OF THE

LIVES, WRITINGS,

AND

INVENTIONS,

Of the most eminent

PHILOSOPHERS

AND

MATHEMATICIANS

Who have flourished from the earliest Ages of the
World to the present Time.

By BENJAMIN MARTIN.

L O N D O N:

Printed and sold by W. OWEN, near *Temple-Bar*, and
by the AUTHOR, at his House in *Fleet-street*.

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TO THE
K I N G

This ACCOUNT of the
LIVES, WRITINGS, and INVENTIONS

Of the most eminent
PHILOSOPHERS and MATHEMATICIANS,

Published,

By his ROYAL PERMISSION,

Under His Most Gracious and Auspicious

P A T R O N A G E,

Is now, with all Humility,

Inscribed,

By his MAJESTY'S

Most Loyal,

Dutiful, and Obedient

Subject and Servant,

BENJ. MARTIN.

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BIOGRAPHIA PHILOSOPHICA;

Or, a succinct ACCOUNT of

The LIVES of the most eminent PHILOSOPHERS and MATHEMATICIANS, from the highest Antiquity to the present Time.

IN WHICH

The Places of their Birth; their peculiar Genius, and Manner of Study; their Travels for Improvement; the particular Branches of mathematical or philosophical Science in which they excelled; the Inventions, and Discoveries they made, and the Books they published on the various Subjects of Natural History, Philosophy, and the Mathematics, will be methodically related, and digested according to the Order of Time in which they lived.

The LIFE of THALES the MILESIAN.



THALES was born, as the best Writers agree, in some Part of the 35th Olympiad, flourished in the 50th, and died about the 58th; the Interval between his Birth and public Appearance in *Greece*, was passed in Study, and Travels in various Parts of *Asia*, and into *Ægypt*; in the former he acquired his first Insight into *Astronomy*, and, in the latter, his first Acquaintance with *Geometry*, *Mystical Divinity*, and *Natural Knowledge*. Having finished his Studies abroad, he returned to his Native City, *Miletus*, and transported the Stock of Learning he had acquired into his own Country.

There are not any particular Circumstances mentioned in his History respecting significant Occurrences in his Travels, other than the Favour he met with from *Amasis* King of *Ægypt*, which Favour he lost by being too free in his Opinions concerning Kings; was, by such Freedom, obliged to leave the Country; which was the probable Cause of his returning, at that Time, to *Miletus*.

In *Miletus* he lived for some Time as private as possible, devoted to Study and Contemplation, and in instructing some few in the Learning he had acquired. These were *Anaximander* and *Anaximines*, both Natives of *Miletus*; and afterwards *Pythagoras*, of what Country unknown, but usually called of *Samos*, so famed, as the Constitutor of the *Italic Sect*, and who assiduously pursued his Master's Steps, both in his Studies, and in his Travels.

Thales, in this his Retirement, was courted by many, but cautiously avoided either attending, or receiving any Favours from them. He was often visited by *Solon*, and is said to have taken great Pleasure in the Conversation of *Thrasybulus*, whose excellent Wit caused our Philosopher to forget that he was Tyrant of *Miletus*.

There flourished, at the same Time with him, six others, distinguished for their singular Wisdom by their Morals, Rules, and Practice; but the Epithet of *Wise* was given to *Thales* for his speculative Learning.

Laertius, and with him various other Writers, agree, that he was the Father of the *Greek* Philosophy, the first that made any Researches into natural Knowledge, or Enquiry into Mathematics.

His Doctrine was, that Water, Moisture, or Humidity is the first Principle of natural Bodies, whereof they consist, and whereinto they resolve; and that *God* is the Mind, which formed all Things of Water.

Of the World, he taught, there was but one, and that made by God; that it is disposed in due and regular Order, and that God animates the whole.

In *Geometry* he is said to have been an Inventor, as well as an Improver; a Science that had its Birth by Necessity in *Ægypt*, where

The LIFE of THALES. 3

where *Thales* acquired his primary Instruction, as Commerce first gave Being, by the like Necessity, to *Numbers*.

He gave the first Light into the Knowledge of scalenous, and other Triangles, many of which *Euclid** has digested into his *Elements*; but that for which he is more particularly celebrated, as being, according to *Laertius*, his Invention, is what now appears as the 47th Proposition of *Euclid*, *That the Sums of the Squares of the two lesser Sides of a right angled Triangle is equal to the Square of the greater Side*; which is, however, disputed as the Invention of his Disciple *Pythagoras*. But all the Writers agree, that he was the first, even in *Ægypt*, who took the Height of the Pyramids by the Shadow, in the Manner the same is now usually effected, and therefore needs not any Illustration.

As an *Astronomer*, he divided the celestial Spheres into five Circles, or Zones, the *Artic*, the *Summer Tropic*, the *Equator*, the *Winter Tropic*, and the *Antartic Circle*, placing the *Zodiac* under the three middle Circles, touching them all as it passes, and each of them cut in right Angles by the Meridian, that extendeth from Pole to Pole: Which have unjustly been ascribed to more modern Discoveries.

He first observed the apparent Diameter of the Sun, which he concluded to be the 720th Part of the Circle or *Zodiac*, which he appears annually to describe about the Earth, which is divided into 360 Degrees; and first discovered the Constellation of the lesser Bear.

He likewise first observed the Nature and Course of *Eclipses*, and calculated them to an Exactness; one in particular, about the 50th Olympiad, memorably recorded by *Herodotus*, as it happened on a Day of Battle between the *Medes*, and *Lydians*, which, *Laertes* says, he had foretold to the *Ionians*. And the same Author informs us he divided the Year into 365 Days; but this Division he seems to have had from the *Ægyptians*. *Plutarch de placit. Philos*, not only confirms his general Knowledge of *Eclipses*, but that his Doctrine was, that an Eclipse of the Sun is occasioned by the Intervention of the Moon, as may be seen in a Bason of Water, or Looking-glass; and that an Eclipse of the Moon is caused by the Intervention of the Earth.

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* Lib. 1. Def. 17. — Prop. 5. — Prop. 15. Id. 26.

4 BIOGRAPHIA PHILOSOPHICA.

The Writers of his Life agree, that he was addicted to judicial Astrology ; and *Tully* thinks there is something in that Science, and of his Acquaintance there-with, which he aims to confirm by the following Story :

That *Thales* being upbraided for his Poverty, resulting from the Study of Science, and foreseeing by his Skill in Astrology, there would be a Plenty of Olives that Year, he purchased all the Gardens about *Miletus* and *Chios*, and thus having acquired a Monopoly, disposed of them again at high Prices, and then told his Neighbours, that it was very easy for Men of Learning to be rich if they chose it, but that Wealth was not their Aim.

Laertius, and some others, agree with *Tully* in the Notion of this being an Astrological Prediction, which is far from being a clear Point: It is sufficient, that he was capable of making a good Judgment of the approaching Season, and that it would be such a Season, as wherein Olives are usually most plentiful. This, however, sufficiently evinces, that he had more worldly Wit than his Neighbours conceived, when he thought proper to employ it; as is the Case of most studious Men, when they turn their Attention that Way, and affect the Object, as by Study they acquire a Sagacity and Penetration not common to the In-attentive: But, as Self-interest is the ruling Passion of our Natures, Men turned only to the Attainment of Wealth, will, with some Reason, smile at those who reduce themselves to Poverty, in order to make others learned.

It is a sufficient Illustration of the Wisdom of *Thales*, that he was the Inventor, or Improver, in many Branches of useful Knowledge; and whether right or wrong in his Contempt of Wealth, his Sagacity in other Respects superior to most Men.

His *Morals* were as just, as his *Mathematics* well grounded, and his Judgement in civil Affairs equal to either; so that his Knowledge was as general, as the Good of Mankind his Care; and as we have given a brief Account of his Skill in Science, it may not be amiss to give here a concise Taste of his *Morals*, summed up in a few Lines.

*Fear e'er thou sin, thyself, tho' none be nigh,
Life fades, a glorious Death can never die;*

Let.

Let not thy Tongue discover thy Intent,
 'Tis Misery to dread, and not prevent.
 He helps his Foes that justly reprehends;
 He that unjustly praiseth, harms his Friends;
 That's not enough, that to Excess extends.

}

He was very averse to Tyranny, and esteemed Monarchy little better in any Shape; he was used to say, That a Tyrant, who chuseth rather to command Slaves than Freemen, is like an Husbandman who preferreth the gathering of Locusts and catching of Fowls, to the reaping of Corn.

Concerning his Writings, it remains doubtful whether he left any behind him. *Augustine* mentions some Books of *Natural Philosophy*; *Simplicius*, some written on *Nautic Astrology*; *Laertius*, two Treatises on the *Tropics* and *Equinoxes*; and *Suidas*, a Treatise on *Meteors*, written in Verse.

His Death happened in Point of Time as is said above; the Occasion appears to have been his attending the *Olympic Games*, where, oppressed with Heat, Thirst, and the Weakness of his Years, he, in public View, sunk into the Arms of his Friends.

He was buried, according to his own Appointment, in an obscure Part of the *Milesian Fields*, where he predicted in future Times their *Forum* should be.

NOTES.

Page 1. Line 2. An *Olympiad* was a Measure of Time used by the antient *Grecians*, consisting of 4 Years; it was first instituted by *Iphitus*, in the Year of the World 3174, on Account of the *Olympic Games*, which were celebrated every 5th Year in the *Planes of Elis*, near the City of *Olympia*, in Honour of *Jupiter Olympius*.

Page 2, Line 22. The Seven Wise Men, were *Thales*, *Solon*, *Pittacus*, *Periander*, *Cleobulus*, *Chilo*, and *Bias*, greatly renowned through all Antiquity.

Page 2, Line 30. That this Doctrine (tho' very antient) is not wide of the Truth, appears by many modern Experiments on the Nature of Vegetation of Plants and the Animal Oeconomy, the Generation of Metals and Fossils, &c. as we shall shew in its proper Place.

ANAXIMANDER.

ANAXIMANDER, a *Milesian*, Countryman, Companion, Kinsman, Disciple, Successor, and Propagator of the Doctrine of *Thales*, was born in the 42d *Olympiad*. He demonstrated the Compendium of Geometry; and first published a Geographic Table. As early as the 50th *Olympiad* he publickly explained the Obliquity of the *Zodiac*, and invented the *Gnomon*. He was Master of every Branch of *Astronomy*, imputed to *Thales*; and if *Tully* and *Pliny* may be depended upon, he was deeply skilled in *Natural Philosophy*, predicting the famous Earthquake that overturned the City of *Sparta*, and tore away Part of the Mountain *Taygetus*; he wrote, as *Suidas* informs us, a Treatise *De Naturâ*: as also one on the *Sphere*, and divers others.

He is said to have differed from *Thales*, holding *Infinity* to be the Principle of all Things; but this, perhaps, is not different, as it is not explained what is meant by *Infinity*, unless this mystical Expression elucidates his Intention: That, *it is one infinite in Magnitude, the Parts thereof changing, the Whole immutable, out of which all Things proceed, and into which all Things resolve*. Hence, that there are infinite Worlds generated, which corrupt and degenerate into that from whence they proceeded.

The various Writers of his Life, considering him as an Astronomer, seem in many Instances either to have misunderstood him, or given us their own Absurdities, for his Opinions; they are therefore, replete with Contradictions, I shall for that Reason only recite such as are consistent with themselves. He held the Doctrine of *innumerable Worlds*; That *the Orb of the Sun is 28 times bigger than the Earth*; and that *the Moon hath a thin Light of her own, besides that which she borroweth from the Sun*.

His Opinions concerning *Meteors* are the same as those espoused by the best Philosophers of later Ages; and his Notion of the Origin of *Beings* was, that the first Creatures were generated in Humidity, which is the same as *Thales* taught, of Water being the Principle of all Things; whence it may be concluded, that *Anaximander* distinguished between Principle and Element.

The Time of his Death is no where ascertained, so as to agree with his Birth, Age, and his being the Successor of *Thales*:

For

For which Reason I shall leave that Particular unnoticed, as a long Criticism on that Head is not material to the present Purpose.

ANAXIMENES.

ANAXIMENES was first the Disciple of *Thales*, and afterwards an Auditor of *Anaximander*; he was of the same Country with both, and the Successor of the latter. He held *Air* to be the Principle of the Universe, of which all Things are engendered, and into which all resolve. That *Spirit* and *Air* are only two Words signifying the same Thing. His general Opinion of the *Heavens* and *Meteors*, was the same as his Masters; and of the Cause of the *Rainbow*, the same as in modern Philosophy: That *Earthquakes* proceed from the Rarity and Dryness of the Earth, from Excess of Heat, or Cold; the latter he called *Contraction*, or *Condensation*, the former *Laxation* or *Rarity*: Thus illustrated, a Man's Breath compressed by his Lips and condensed, is cold, (as when we blow on any Thing to cool it,) but issuing from an open Mouth, is hot, by reason of its Rarity. And more than this we do not find concerning him.

ANAXAGORAS.

ANAXAGORAS was a Native of *Glazomena*, and born in the 67th *Olympiad*. He was eminent for his noble Birth and wealthy Possessions, but more for his Contempt of them, which he quitted for the Delights of Philosophy, turning his Thoughts from Civil Affairs to the Acquisition of Natural Knowledge; but for his Improvidence herein *Plato* highly blames him, because a Competency might rather assist, than be an Impediment to him in the Attainment of human Wisdom. Being asked, Why he had no Regard to his Country? he, pointing to the Heavens, answered, *My greatest Regard is to my Country*. And again, To what

what End he was born? he answered, *To contemplate the Sun, Moon, and Heavens.*

In the 20th Year of his Age he went to *Athens* to study Philosophy, and continued there 30 Years. He is reputed the first who added *Mind* to *Matter*, and on that Account he was honoured by the *Athenians*. Some of his Contemporaries, however, disputed his Right to this Honour; alledging, That this Sentiment was taught much earlier, as no Doubt it was, tho' not in that Country.

His Opinion of a supreme Being was much clearer, more rational, and intelligent; than any of his Predecessors in *Greece*; he held that God is an infinite self-moving Mind, and the efficient Cause of all Things; that the same divine Mind, out of infinite Matter consisting of similar Parts, made every Thing according to its Species, reducing into Order what was before confusedly mingled together. His Conceptions of Nature were, That the upper Regions were replete with Fire, and the operative Power there he called *Æther*. His Notion of the *Sun*, that it was a burning Plate, the common Opinion of that Time; but that the *Moon* was a dark Body enlightened by the *Sun*, habitable, having Hills, Plains, and Waters; that the Inequality in her Face proceeded from a Mixture cold and Earthy, and that the *Milky Way* is the Light of some Stars.

The *Winds* he conceived to proceed from an Extenuation of the Air by the Sun: And that *Earthquakes* are caused by the Air, apt to ascend, but finding Difficulty in getting out, causeth that Perturbation, effected principally by the exterior, at certain Times breaking in upon the interior Air, and there producing the same Force as we perceive, when, upon the Collision of the Clouds, and Motion of the agitated Air, they produce Thunder and Lightning.

His Thoughts concerning the Animal World, That Creatures were first generated by Humidity, Calidity, and earthy Matter.

That the Voice is produced by the striking of the Wind against firm resisting Air, returning the Counter-blow to the Ear; which is the Manner whereby also the Repercussion of the Air is formed called *Echo*; and that the *Gall* is the Cause of *acute Diseases*, which, over-flowing, is dispersed into the *Lungs, Veins, &c.*

Laertius

Laertius assures us, that this *Anaxagoras* studied Natural Philosophy in *Athens* for 30 Years successively, and that *Pericles* the Son of *Xantippus*, *Archelaus*, the Son of *Apollodorus*, *Euripides*, the celebrated Grecian Poet, and *Socrates*, the Son of *Sophroniscus* (with a great Number of other Auditors too tedious here to enumerate) were his favourite Pupils, and gave constant Attendance to his Lectures.

Laertius likewise mentions *Metrodorus* of *Lampsacum* as an intimate Friend, and One, who paid him all the Marks of the highest Esteem and Veneration on Account of his profound Learning.

Though there are some Historians, indeed, who affirm, that *Democritus*, notwithstanding he was 40 Years younger than *Anaxagoras*, was one of his Disciples; yet *Laertius* endeavours to confute that Notion; for he peremptorily insists, that *Anaxagoras* was so far from giving him any friendly Instructions, that he conceived an implacable Aversion to the Man, and industriously shunned all Familiarity and Converse with him. And *Phavorinus* assures us (as a Confirmation of this natural Disgust) that *Democritus*, perceiving such a singular Coldness in *Anaxagoras*, and his too visible Neglect of his profered Friendship, professed himself an open Antagonist, and absolutely denied, that the Doctrines which he advanced in regard to the Sun and Moon were just; and asserted, in order to depreciate them, that he had only imbibed some favourite Tenets of the Antients, and, like a Thief, had palmed them on the Public for his own Conceptions; in a Word, that his Description of the World and his Sentiments concerning the Mind were very erroneous, imperfect, and altogether unworthy the Attention of the Curious.

This *Anaxagoras* endeavoured (as much as in him lay) not only to instruct his Disciples in the Grounds of Natural Philosophy; but to free their Minds from all superstitious Terrors, arising from their Want of Knowledge and Penetration into physical Causes; and the following Instance, (amongst many others which might be produced) will be sufficient to convince the Reader of his profound Knowledge in that particular Science. The Incident was this; the Head of a Ram was one Day produced before his Pupil *Pericles*, with but one Horn; which, by the *Magi* or *Soothsayers* at that Time, was looked upon as a Prodigy;

the Pupil brought it to his Master, who immediately, to convince him of the Folly of such superstitious and enthusiastic Notions, dissected it before his Face, and demonstrated, that the Ram's Brains lay out of their natural Situation, and had by Degrees, been contracted into an oval Form towards that Part where the Horn grew.

Some Years after this, finding himself infirm, decrepid, and greatly neglected by his Pupils, to what he had been, he grew melancholy, and so weary of the World, that, in a Fit of Resentment, he rashly resolved to starve himself, and be no longer the too visible Object of Contempt.

Laertius, however, gives him quite another Character, and much more to his Reputation and Advantage. There are various Conjectures, says he, in regard to the many Misfortunes which he laboured under during his old Age.

Sotion insists, that he was charged by one *Cleon* with Impiety towards the Gods; and with maintaining that impious Notion of the Sun's being a burning Plate; but that his Cause was so strenuously espoused by his Pupil *Pericles*, that when his Case came impartially to be heard, instead of having Sentence of Death past upon him (as his Enemies not only wished, but fully expected) he was only fined five * Talents, and banished for a short Time.

Satyrus, however, peremptorily insists, that he was summoned before the Court, by *Thucydides*, who was of the contrary Party to *Pericles*, and accused, not only of maintaining impious and false Doctrines, but of Disloyalty, and holding secret Correspondence with the *Persians*; and that, though he was absent, Sentence of Death was instantly past upon him; that when the News was brought him, not only that his two Sons were actually dead, but that he himself was to be executed as a Traytor to the Government, he was so far from being dejected and cast down (as was before hinted in regard to his Intention of *Suicide*) that he heard the melancholy Relation, with such an amazing *Æquanimity*, and Presence of Mind, that he only made the following Answer (without the least visible Emotion or Concern) “ You tell
“ me Nothing new or unexpected. Nature has long since con-
“ demned both my Sons and me to Death. As to them, I know
“ very

* An *Attic* Talent was equal to 139*l.* 15*s.* Sterling.

“very well that I begat them Mortals.” And *Demetrius Phalareus* assures us, that he interred them Both with his own Hands.

Hermippus, on the other Hand, insists, that he was actually imprisoned in order to suffer Death; but that *Pericles* before-mentioned appearing before the Judges in his Defence, procured his Discharge; but that he laid violent Hands on himself, in the Goal, not having Courage sufficient to support himself under that public Disgrace.

Hieronymus and *Laertius* both insist, that his Friend *Pericles*, when his Trial came on, brought him into Court in such a poor, tattered Condition, and so greatly emaciated with Sicknefs, that he appeared to the Judges rather as an Object of their Compassion than their Justice.

Suidas again tells us another Story; and insists, that the *Athenians* threw him into Prison for introducing new and heterodox Notions concerning the Supreme Being; and afterwards banished him to *Lampsacum*, where he starved himself to Death.

Josephus says, that the general Notion, prevailing over all *Athens*, that the Sun was the Supreme Being, or God, which *Anaxagoras* affirmed to be without all Sense or Knowledge, he was by the Votes of some of his Judges sentenced to die for his impious and prophane Doctrines.

If, however, we will give Credit to *Plutarch*, who is an Historian, of equal, if not superior Reputation to any of the others before quoted, he was neither condemned nor censured by any Persons whomsoever, but by *Pericles* himself.

His Departure from *Athens*, however, some insist, was no less than 30 Years after his Arrival at that City, that is to say, in the 3d Year of the 82d *Olympiad*, and in the 63d Year of his Age; from whence he went to *Lampsacum* abovementioned; where he resided for two and twenty Years successively, and was so regardless either of the Interest and Advantage of the *Athenians*, or his own Country, that he said they were more obliged to him than ever he was to them; and when he fell sick, according to *Cicero*, being asked by his Friends whether he would be conveyed to *Clazomene*, his native Country; he answered in the Negative, saying, “that it was altogether needless, since the Road to the Grave” was every where alike.” And *Plutarch* assures us, that before his Decease, the Magistrates of the City asked him if there were any

Favours in their Power to confer upon him? To this his Answer was somewhat ludicrous, though innocent enough; all I desire is, that the Youth of the Place may be indulged with an annual *Play-day*, on the Day of my Decease; which Custom (according to *Laertius*) was religiously observed for many Years afterwards.

He was interred some few Days after his Death by the Inhabitants of *Lampsacus*, in a very magnificent and pompous Manner; with an Inscription on his Monument; intimating, that under that Stone lay the venerable *Anaxagoras*, and the greatest Philosopher of his Age.

There were two Altars erected to his immortal Memory, if we will confide in *Ælian's* Account of him; One inscribed to the *Mind*; the Other to *Truth*.

Laertius, whom we have quoted so often, and who has given us some valuable Memoirs of his Life, concludes it with the following Epigram.

*Fam'd Anaxagoras the Sun defin'd
A burning Plate, for which to die design'd;
Sav'd by his Pupil Pericles; but he
Abandon'd Life, to sad Philosophy.*

As to his Writings, we are told by *Laertius*, that he was the first that published any Treatise of Natural Philosophy, which was censured by *Plato*; but whether with just Grounds or not, we shall not take upon us to determine.

He published likewise another Treatise, entitled, *The Quadrature of the Circle*, which *Plutarch* assures us, that he wrote during the Time of his Imprisonment.

There were three Others (according to *Laertius*) of the same Name, *viz.* a celebrated Orator, and Disciple of *Isocrates*; the Second, a Statuary taken notice of by *Antigonus*; and the last, a *Grammarian*, a Disciple of *Zenodotus*: To say any more of them, however, would be foreign to our Purpose.

We shall conclude this short Account of him with his few memorable Maxims, *viz.*

I. Being once asked whether the Mountains of *Lampsacum* would, in Process of Time, become Sea? His Answer was, Yes; in Case Time did not fail first.

II. Upon his taking a transient View of the Tomb of *Mausolus*; he said, a sumptuous Monument was a Demonstration, that the Substance was converted into Stone.

III. He peremptorily asserted, that *Homer's* poetical Productions consisted of Virtue and Justice; to which another added the following short Encomium, that he was an able and experienced natural Philosopher.

IV. He conceived, that the Time before our Birth, and the Time we are asleep, are both Lessons of Instruction and Importance.

A R C H E L A U S.

WHETHER *Athens* or *Miletum* was the Place of his Nativity; or whether he was the Son of *Apollodorus*, or of *Mylon*, Historians are not fully agreed: He was a constant Attendant, however, on the Lectures of *Anaxagoras*, and some considerable Time afterwards Tutor to the celebrated *Socrates*.

Notwithstanding, he is said to be the first that ever transferred natural Philosophy from *Ionia* to *Athens*, and was dignified with the Title of *The natural Philosopher*, by Way of Pre-eminence; yet *Casaubon* peremptorily denies that Circumstance to be real Matter of Fact, and not without very just Grounds; for it was very well known, that his Tutor *Anaxagoras* had taught natural Philosophy in that very City for thirty Years successively, before *Archelaus* assumed the Character, or Office, of a public Preceptor.

He was the last, indeed, that devoted the principal Part of his Time to that peculiar Study; for his great Pupil *Socrates* was afterwards a Professor of Morality, and more famous on Account of his Golden Maxims and Precepts for the Conduct of Life, than for his extraordinary Penetration and Researches into Nature.

14 BIOGRAPHIA PHILOSOPHICA.

Notwithstanding this, it must be allowed, that *Archelaus* had some Insight into moral Philosophy before him; for he had wrote a Treatise on the Laws, and on Things honest and just, before *Socrates* was in any Repute; and 'tis highly probable, that he was indebted to his Master's Works for his first Hints in that particular Branch of useful Knowledge.

'Tis true, indeed, that *Socrates* carried it to a much higher Pitch of Perfection, and for that Reason was generally looked upon as the Inventor; however, he could not possibly be so in Fact; for (as *Gassendus* very justly observes) moral Philosophy was of a much more antient Date.

The seven Philosophers, before mentioned in the Life of *Thales*, had the Attribute of *Wise* conferred upon them, principally on Account of their profound Skill in *Œconomics*. It must be allowed, however, that *Socrates* had some Right and Title to the Honour of being the Author of that Philosophy; since he was the first that ever reduced it into a Science.

All we have to add here in regard to this *Archelaus*, are the peculiar Doctrines which he maintained.

I. He held, that the Mind, and the Rarefaction and Condensation of the Air, (whereof one was Fire and the other Water) were the Principles of all Things.

II. That Heat and Cold were the two Causes of Generation.

III. That the Stars were all burning Plates, and that the Sun was by far the largest of those Stars.

IV. That all Animals, of what Species soever, were produced from a Sort of Slime, or warm Earth; that such humid Matter being dissolved by the Fire; such Part of it as settled into a fiery Substance was the Earth, and that which evaporated was the Air.

V. That the Motion of the Earth was owing to the violent Impulsion of the Winds, one upon another.

VI. That the Voice was a Percussion of the Air.

VII. And Lastly, that what was just or dishonest was defined by Law, and not by Nature.

These five Philosophers, namely, *Thales*, *Anaximander*, *Anaximenes*, *Anaxagoras*, and *Archelaus*, gradually succeeding one another, compleat the *Ionic* Sect.

T H E

ACADEMIC PHILOSOPHERS.

P L A T O.

AS *Socrates* was the Pupil of *Archelaus*, the last of the *Ionic* Sect, as before hinted, our Readers may probably expect, that we should first give an Account of that *great Man*, before we enter on the Life of *Plato*; but as he wholly applied himself to the Study of Morality, and neglected both natural Philosophy and the Mathematics, it would be foreign to our Plan to say any Thing more of him, than that he was the truly venerable Tutor of this Founder of the *Academic* Sect, who were so distinguished from the Place called *Academia* (a pleasant Grove with shady Walks and Seats) at *Athens*, in which the Professors of Philosophy daily taught their Disciples.

This *Plato*, then, was an *Athenian* by Birth; notwithstanding there are some Historians who tell us, he was a *Theban*. He was the Descendant of a very antient and illustrious Family; but we shall not here expatiate on his Pedigree; for we doubt not but it will be sufficient for our Purpose, to assure our Readers, that his personal Merit ennobled him much more than his high Descent. Historians, indeed, widely differ in Point of the Time when he was born; but most of them allow, that it happened in one of the Years of the Eighty-eighth Olympiad.

He was peculiarly happy in being inured, even in his Youth, to Hardships and Fatigues; and in taking a great Delight in Study, and the Practice of every Virtue; which Virtues increased in him gradually with his Years. *Laertius* assures us, that he received his first Rudiments of Learning from *Dionysius*, the Grammarian; and the Art of Wrestling (a manly Exercise then in high Repute, as being one of the *Olympic Games*) of one *Aristo* an *Argive*.

It was this Tutor of his, who gave him the Name of *Plato*; for he was named *Aristocles*, by his Parents, after his Grandfather.

father, when an Infant, which Name, however, was worn out by Degrees, and he retained the former to his dying Day.

As to his Person, he was very robust, and remarkably broad-shouldered, to which his new Name alludes; and, in short, Nature was peculiarly indulgent to him. He had one Imperfection, however, and that was (according to *Timotheus*) a slow Voice, or, more properly speaking, an Impediment in his Speech.

As he grew in Years, he applied his Mind very closely to Music, Painting and Poetry; and he arrived, by that Time he was Eighteen Years of Age, to such a Pitch of Perfection in the last, that he not only wrote several select Poems, but four dramatic Entertainments (as was then the Custom) which he delivered to the Players, in order to be acted, proposing at that Time to stand Candidate for the Laurel on the *Olympic* Stage; but hearing, by Accident, on the Day preceding that of the intended Representation, a long and learned Harangue of *Socrates* before the *Bacchanals* on the same Stage, he dropt his intended Contest all at once, and charmed with his Elocution, set Fire to all his poetical Productions that very Night.

When he arrived at the Age of Twenty, he became a Disciple of *Socrates*, and studied Philosophy under that accomplished Moralist, about the 4th Year of the 92d *Olympiad*.

He lived with *Socrates* for eight Years successively, in which Time he committed to Writing (as was customary amongst his Brother-Pupils) the Purport of a great Number of his Master's most excellent Discourses, which he digested by way of philosophical Conversations; but made so many judicious Additions and Improvements, that *Socrates* himself, hearing him rehearse one Day his *Lysis*, cried out, Oh, *Hercules*! How many fine Sentiments does this young Man ascribe to me, that I never thought of! And *Laertius* assures us, that he composed several Discourses which *Socrates* had no Manner of Hand in. At the Time when *Socrates* was first arraigned, which happened in the first Year of the 95th *Olympiad*, our *Plato* was a junior Senator, it is true, but then he was at least Thirty Years of Age; for according to *Solon's* Law, no one was allowed to sit in the Senate-house under that Age. The Judges being highly disgusted at the Deportment of *Socrates*, *Plato* assumed the Orator's Chair, in order to plead his Master's Cause; but was interrupted in the ve-

The Judges, in short, were so far exasperated against *Socrates*, that they pass Sentence of Condemnation upon him. *Plato*, however, begged of him to accept of such a certain Sum as would be sufficient to purchase his Enlargement; but *Socrates* peremptorily refused the generous Offer.

Plato, finding his Master thus obstinately bent on his own Ruin and Destruction, left *Athens* with Tears in his Eyes, and withdrew, being accompanied by several of his Brother-pupils, to the Habitation of one *Euclid*, who entertained them all in the most hospitable Manner, 'till the Storm was blown perfectly over.

Notwithstanding the high Opinion he conceived of *Socrates* and his Doctrines, which doubtless were just and beautiful enough; yet all of them were insufficient for the filling of his capacious Mind: He thirsted still (says *Cicero*) to drink larger Draughts from the Fountains of Learning, and determined (as he had unhappily lost his Master) to travel to any Place, how remote soever, for the Improvement of his Studies.

Accordingly his first Expedition was to *Italy*, where he had heard large Encomiums of the *Pythagorean* Philosophers, who resided in those Parts; and in their Schools it was (as they themselves boast) that he received his first Instructions in natural Philosophy. Being conscious to himself, however, that, if he would but travel into more remote Parts, he should be able to make still farther Improvements, he went from thence directly to *Cyrene*, where he studied Geometry, and some other useful Parts of the Mathematics, under one *Theodorus*, who was at that Time universally admired as an Adept in that particular Science.

From thence he travelled into *Egypt*, and acted there in the Capacity of an Oil-Merchant; but the Advantages arising from Traffick were the least Part of his Concern; his principal Aim was, to pry as narrowly as possible into their Institutes of *Arithmetic* and *Astronomy* (as *Cicero* assures us) and to be fully informed of all the Ceremonies and religious Customs of their Prophets.

He travelled all over the Country (according to *Valerius Maximus*) and informed himself, by holding frequent Conversations with the Priests wherever he went, of all their Notions with respect to *Geometrical* Proportions, and the various Motions of the

Celestial Bodies: And during the Time that the young Students at *Athens* were enquiring after *Plato*, in order to become his Disciples, he was employing himself in taking an accurate Survey of the Banks of the River *Nile*, the vast Extent of the Country, and the meandring Compass of its Trenches, and in acting as a Pupil under the Instructions of some of the wisest as well as oldest of the *Egyptians*.

Having finished his Survey to his own private Satisfaction, he at last settled himself in the Province of *Sais*; where he learned, from the wise Men of that Place, the Notions which they held concerning the Universe, its Nature and Origin, the Motion of the heavenly Bodies, &c.

From the Natives of this Place (as *Pausanias* assures us) he learned the Doctrine, not only of the Immortality, but the Transmigration of the Soul into various Bodies.

Having resided there a sufficient Time, he determined to re-visit *Italy*, and accordingly arrived there safe, and settled himself at a Place called *Tarentum*, where he kept Company principally (according to *Cicero*) with *Eurytus* the Elder, and one *Archytas*.

Thus he added to what he had learned from *Socrates* and from the *Egyptians*, the Doctrine of *Pythagoras*; and informed himself in several Articles, which *Socrates* totally neglected, as not thinking them any ways essential to the Happiness of this Life; for he made nothing, in short, his Study, but the strict Rules of Morality and Logick.

Plato, if we may credit *Eugubinus*, borrowed the mysterious and intricate Part of his Philosophy, but more particularly that which relates to the divine Goodness, from *Hermes Trismegistus*. It is to be presumed, however, that this Assertion was grounded rather on his own Conjecture, than any real Authority that he had to support it. 'Tis imagined by some, that *Plato* received abundance of Information from the sacred Writings of *Moses*. *Josephus* tells us, that in divers important Articles *Plato* copied after their great Law-giver: And another Jewish Author asks the following Question, What is *Plato*? and then returns this immediate Answer, viz. Nothing but *Moses* speaking Greek instead of Hebrew.

Now,

Now, tho' it be true, that there may be some small Affinity between the Writings of *Plato* and *Moses*, yet 'tis highly probable, that he never had any Inspection of the sacred Scriptures; so that the Notion at best is but mere Conjecture.

When *Plato* went to *Sicily*, he purchased (as *Laertius* affirms) the valuable Writings of one *Philolaus*, a *Pythagorean*, who was in great Repute there at that Time. The whole was digested into three several Tracts on natural Philosophy; which were the First (as we are told) that were ever exposed to public Sale in that School. Some will have it, that he procured them from a Friend of *Dionysius* for the Value of four *Alexandrian Minæ*. Others say, that *Dionysius* bought them of a young Gentleman, that was a Pupil of *Philolaus* the Philosopher, and bestowed them on *Plato* as a free Gift. Others again insist, that he sent to *Dion* at *Syracuse*, and requested him to purchase them for him at any Price he thought proper to give, which he bought accordingly, at the Rate of 100 *Minæ*: But, if we may credit *Aulus Gellius*, he says, the Purchase-money amounted to 10,000 *Denarii*. Whatever Value, however, were put upon them, be it more or less, *Plato* could very well afford it at that Time; for not long before he had received no less than 80 Talents from *Dionysius*.

Now out of those valuable Writings, it is generally thought (as both *Aulus Gellius* and *Laertius* positively affirm) that he stole (as the Critics term it) the best Part of his universally admired *Timæus*; for which he is too severely reflected on by one *Timon*, in his *Sillis*, who envied him for his superior Wisdom.

In order to depreciate him, the sarcastical Passage is couched in the three following Lines.

You, Plato, with the same Affections caught,
With a large Sum a little Treatise bought,
Where all the Knowledge which you own was taught.

Alcimus and *Laertius* likewise tax him with borrowing very largely from *Epicharmus*, the Comic Poet; and both quote several Passages for the Confirmation of what they assert.

Phavorinus, moreover, boldly affirms, that the whole Sum and Substance of *Plato's Common-wealth* is to be met with in

Protagoras's Antilogics. As to his political Writings, they were all stolen (as others with equal Assurance and ill-Nature affirm) from his great Master *Socrates*.

And lastly (to mention no more) *Laertius* assures us, that the most valuable Part of his moral Tracts, are little or nothing more than Extracts from the universally admired Book of *Sophron*, the *Minograph*, which were found under his Pillow at the Time of his Decease.

Now all these several Charges upon him, as a Plagiary, it must be allowed, are very heavy, and the evident Effects of Spleen and Ill-nature; but we think them, in Reality, no Aspersions at all, as they are not only beyond Measure partial, but absolutely unjust.

That he obtained his Learning from the Perusal of the best Authors then extant, and from his constant Attendance on the Lectures which his several Masters read from Time to Time in public, redounds, in our Opinion, greatly to his Credit; and none but those, who envied him for his superior Merit to their own would presume to depreciate him on that Account. On the contrary, his great Improvements drawn from thence are incontestible Proofs of his Judgment and indefatigable Industry in the Course of his Studies; for had the same Authors asserted, that he received it any other Way, it must have been by Inspiration; and had they advanced such an idle Notion, we should have deemed them either void of Understanding, or very partial Historians.

That he borrowed his Thoughts, therefore, from all the Books he could by any Means procure, and from his frequent Conversations with Men of the profoundest Learning, we will readily allow; but then, in case it manifestly appears, that he made large Additions and Improvements to those literary Flowers, from whence, like the industrious Bee, he extracted the best Part of his Honey; and that he turned and applied each Branch of Literature in a widely different Way, or to quite different Purposes than it ever had been applied before; if, in short, it be evident, that he brought to Light, and exposed to public View, what the wise Men of that dark Age so very disingenuously studied to keep concealed, in order to enhance their own Wisdom, and to meet with distinguished Deference and Respect from

from the Vulgar ; if he did nothing more, we say, than this, and that therefore he could not, in a strict and proper Sense, be deemed an absolute Inventor ; yet still he ought, at least, to be highly valued, and looked upon as one of the profoundest Scholars of his Age, and justly merited that high Title by which he was afterwards distinguished, namely, *Plato the Divine*.

Being returned to *Athens*, after his many long and fatiguing Journeys, he settled himself in a particular Spot (at some small Distance from the City) called the *Academy*, as we are told, from one *Ecademus*, which was surrounded with Woods, and reckoned a very unhealthful Situation. *Plato*, indeed, was advised by his Physicians to remove from thence to the *Lyceum*, but he turned a deaf Ear to all their Persuasions ; for he had made choice of it, it seems, as a necessary Corrective to his Corpulency, and with Hopes that it would incline him to fall away. His own Prescription, indeed, met with the desired Effect ; for he soon caught there a Quartan-Ague, which shook him very severely for a whole Year and a Half ; but by the Dint of Temperance, and a very abstemious Course of Life, he at last conquered his Distemper, and recovered his Strength to that Degree, that he was more active and vigorous than ever he had been before his Indisposition.

He went thrice into the Field of Battle. His first Expedition was to *Tanagra* ; his next to *Corinth*, and his last to *Delos*, in which Engagement the Party he espoused became victorious. Thrice likewise he travelled into *Sicily* ; the first Time he went thither with no other View, than to gratify his Curiosity, and be an Eye-witness of the Eruptions of Mount *Ætna*. At that Time he was about 40 Years of Age ; and went to pay the Tyrant *Dionysius*, the Elder, a Visit, who had testified a great Inclination to have some Converse with him. The Liberty, however, which he took in discoursing on the Topic of Tyranny had like to have cost him very dear ; and his Death had proved, in all Probability, the fatal Consequence, had not one *Dion* and *Aristomenes* pleaded hard in his Behalf. Tho' the Tyrant, indeed, thro' their Intercession, spared his Life ; yet he shewed his Resentment so far, that he delivered him up to one *Polides*, a *Lacedemonian* Ambassador, at that Time resident at *Dionysius's* Court, with express Orders for his being sold as a Slave. That

Ambassador soon after conveyed him away to *Egina*, and there executed the Tyrant's Commission. The Natives of that Place had passed a Law, by Virtue whereof, every *Athenian* was strictly enjoined not to enter their Island upon Pain of Death. His Presumption, therefore, was insisted upon by one *Charmander*, the Son of *Charmandrites*, as a capital Crime, and that he ought in Justice to die for so open a Violation of their Laws: But some Persons then present, not being so very vindictive, made a nice Distinction in his Favour; namely, that such Law was made to deter *Men* from approaching their Island, but not *Philosophers*. This Distinction prevailed; and they contented themselves with punishing him no farther than by selling him for a Slave. Very providential was it for poor *Plato*, that one *Anniceres*, a Native of *Cyrene*, happened at that Time to be resident in the Island, who purchased him for the Consideration of twenty *Minæ*. No sooner was the Money paid, but his new Master very generously took the first Opportunity of sending him back to *Athens*, and restoring him to his Friends. As for *Polides*, the *Lacedemonian*, who had sold him first, he was defeated by one *Cabrias*, and was afterwards thrown headlong into the Sea, as a just Punishment for the severe Afflictions which he had caused so divine a Man as *Plato* to undergo; and if the Report may be credited, he was informed by an Apparition of his approaching untimely End.

Dionysius the Elder being informed that *Plato* was arrived once more at *Athens*, in a State of Freedom, contrary to his Expectations; was under some Apprehensions that *Plato* would study some Way or other to gratify his Rage and Resentment, for the Indignity that had been offered him; he wrote, therefore, a very complaisant Letter to him, wherein he, in Effect, tho' not in direct Terms, begged his Excuse for degrading him as he had done; and insinuated, that it was with Pleasure, he heard of his residing again amongst his Friends. *Plato*, however, sent but a very cold Answer to the Tyrant, which was to this or the like Effect, *viz.* “ That he need not give himself any great
 “ Concern about what had passed; for his Thoughts were so
 “ much taken up with the Charms of Philosophy, that he had no
 “ Time to spare in the Gratification of any private Resentment.”

To some of his Detractors, who upbraided him, some Time afterwards, with his being discarded by *Dionysius* the Tyrant; he

he made Reply, that it was a false Assertion, that *Dionysius* had abandoned *Plato*; but the contrary is true, that *Plato* has abandoned *Dionysius*, as a Tyrant, and the just Object of his Scorn and Contempt.

He went the second Time to *Sicily*, in the Reign of *Dionysius* the younger, with a View to prevail on that Tyrant, if possible, to restore his Fellow-Citizens to the Enjoyment of their former Privileges; or, at least, to treat his Subjects with more Lenity than his Father had done before him; but after he had resided there for four Months, and perceived plainly, that the Tyrant turned a deaf Ear to all his Solicitations in Favour of his Countrymen; that he had moreover sent his good Friend *Dion* into Exile, and continued resolute to tread in the Foot-steps of his tyrannical Predecessor, he went back to *Athens*, highly disgusted, notwithstanding the Tyrant pressed him very earnestly to tarry at his Court, and used his utmost Endeavours to convince him, that his Friendship and Respect for him was perfectly sincere.

The last Time he went to *Sicily* was, with a View to solicit the Tyrant once more in Favour of his Friend *Dion*, and prevail on him, if possible, to divest himself of his despotic Power; but as *Dionysius* had promised faithfully, that *Dion* should be restored, and paid no Regard, in Effect, to his most solemn Engagements, he took the Liberty to upbraid him for his Want of Sincerity in such warm Terms, that provoked the Tyrant to so high a Degree, that he run the Risque of his Life; and in all Probability he had been actually cut off, had not *Archytas* of *Tarentum* sent an Ambassador to him on Purpose to require him at his Hands, and a Vessel likewise for his Embarkation. *Dionysius*, at the Intercession of *Archytas*, did not only permit him to go on board, but furnished him with all the necessary Provisions for his Voyage. Thereupon *Plato* withdrew to *Athens*, with an Intention never to depart from thence again: Upon his Arrival he was received with all the public Testimonies of the highest Deference and Esteem; but notwithstanding they entreated him to take upon him the Reins of Government, he peremptorily refused to accept of the Honour of so important a Post, as firmly believing, that, in the Midst of such a general Depravation of Manners; there were no Hopes of making any considerable Reformation.

No greater Testimony, however, can possibly be produced of that high Veneration and Esteem which all *Greece* had for him, than the following remarkable Circumstance which actually happened at the *Olympic Games*. He was there received more like a God descended from the Clouds, than a mortal Man: For the countless Multitude, who were excessive fond of all Sorts of public Shews, and had flocked thither from all Parts of *Greece*, in order to be Spectators of the *Olympic Games*, which were always executed with the utmost Pomp and Magnificence, abandoned at once, not only the Diversion of their various Races, but of their Athletic Encounters likewise; for no other Pleasure than that of gazing on the Man of whom they had heard so many marvellous Relations.

He spent his whole Life in a State of Celibacy, and kept up to the strictest Rules of Temperance, and Self-denial. He was of so reserved a Temper, even in his Youth, that he never was known to express a Pleasure, with any greater Emotion than that of a Smile; and he had such a perfect Command of his Passions, that nothing could provoke his Anger or Resentment. And we are told, by way of Confirmation, that a young Pupil of *Plato's*, who had resided with him for some considerable Time, going accidentally home to pay a Visit to his Relations, was so perfectly surprized one Day to see his Father in a Passion, that he could not forbear from remarking, that he had never seen any Thing like it at his Master's House. Once, indeed, it happened, that one of his Slaves had provoked him to a very high Degree, by the Commission of some very heinous Fault; but he gave Orders to one of his superior Domestics to correct him; saying, that as he was a little too angry, he was not duly qualified to give him the Chastisement he deserved. Notwithstanding he was naturally of a reserved, and very pensive Disposition; yet, if we may credit *Aristotle*, he was affable, courteous, and perfectly good-natured; and sometimes would condescend to crack little innocent Jokes on such of his Acquaintance as he thought he might make free with. Every now and then he would advise his two intimate Friends, *Xenocrates* and *Dion*, whose Deportment he imagined somewhat too rigid and reserved, to sacrifice now and then to the *Graces*, in order to render their Conversation a little more free and easy.

Plato had a great Number of Pupils ; but the three who made the most distinguished Figure afterwards, were *Spusippus*, his Nephew, by *Potona* his Sister, who was the Spouse of *Eurimedon*, *Xenocrates* the *Caledonian*, and the celebrated *Aristotle*. Some Historians peremptorily assert, that *Theophrastus* was another of his Disciples ; and that the celebrated *Demosthenes* likewise looked upon him as his Master. In a Word, this last-mentioned Pupil, having fled for Shelter to some proper Asylum, in order to secure himself from the Resentment of *Antipater* ; when *Archias*, whom *Antipater* had sent in order to bring him by Force before him, promised him, upon Honour, that he should not lose his Life, in case he would voluntarily resign, and make his personal Appearance : God forbid ! said he, that after I have heard *Xenocrates* and *Plato* discourse so divinely on the Immortality of the Soul, that I should prefer a Life led in Infamy and Disgrace before an honourable Death.

Some Authors assure us, that there were two young Ladies amongst the Number of his Auditors, one named *Lasthemia* the *Mantinean*, and the other *Axiothea* the *Phlyasian* ; both disguised in Men's Apparel, as being deemed by them the most proper Dress for female Philosophers.

He had such a peculiar Affection for the important Science of *Geometry*, that is to say, the true Mathematical Rule of Proportion, that he ordered the following Inscription to be painted in large Capitals over the Door of his Academy. LET NO ONE PRESUME TO ENTER HERE UNLESS HE HAS A TASTE FOR GEOMETRY AND THE MATHEMATICS.

All the Works of *Plato*, except his twelve Letters, which are to be met with only in the Closets of the Curious, are digested, by Way of familiar Dialogues. These Conversations may properly be divided into three different Species ; in the first he confutes the Sophists ; the second is peculiarly adapted to the Instruction of Youth ; and the last are more peculiarly calculated for the Information of such as are more adult, and Persons of the deepest Penetration. There is likewise another Distinction to be made, in regard to his dialogical Discourses ; for whatever Position *Plato* lays down, when he assumes his own Name, either in his Treatise on the Laws, or in his *Epinomis*, he speaks

his own real Sentiments; but whenever he advances any Doctrines in a fictitious Character, that is to say, when he borrows the Name of *Socrates*, *Timæus*, *Parmenides*, or *Zeno*, he only lays them down as probable Conjectures, without any Confirmation of them as his own private Opinion. Notwithstanding, what Words he puts into the Mouth of *Socrates*, in any of his Dialogues, are always in the Taste, and according to the Form and Method of Disputation prescribed by his great Master, we must not always take it for granted, that what he says are the real Sentiments of *Socrates*; since we are informed from very sufficient Authority, that when *Plato* had read in Public his Dialogue entitled *Lysis*, on the Topic of Friendship, which he composed in his Master's Life-time, *Socrates* could not refrain from inveighing against it, crying out, *Ye Gods! what Doctrines has this young Man made me advance, which never once entered into my Thoughts!*

The Style of *Plato*, according to the Testimony of *Aristotle*, his Pupil, was (if we may allowed the Expression) a Medium between Poetry and Prose. *Cicero* entertained such a peculiar Veneration for the Beauties of it, that he did not scruple to assert, that if *Jove* himself was inclined to talk in any human Language whatsoever, he would never have expressed his Thoughts in any other Style than *Plato's*. *Panætius* distinguished him by the venerable Title of *Homer* the Philosopher; which amounts to much the same Compliment, since paid him by the universally admired *Quintilian*, who, in his Animadversions on the nervous Style of all his Compositions in general, was pleased to say, they were Copies of the divine Writings of *Homer* himself.

His Plan was built on the Sentiments of three very profound Philosophers. He gave entirely into the Notions of *Heraclitus*, in regard to natural and experimental Philosophy, that is to say, such Objects as were open and obvious to the Eye, with respect to the Metempsychosis, or the Transmigration of Souls, and such Truths as were only to be discovered by the Dint of Reflection, he followed very closely the Foot-steps of *Pythagoras*. As to his political and moral Tracts he made his Master *Socrates* his grand Exemplar, and, in his humble Opinion, no One's Sentiments besides could stand in Competition with them.

Plato,

Plato, if we may rely on the Veracity of *Plutarch*, in his first Book on the Maxims of the Philosophers, admits of three Principles, the Supreme Being, Matter, and the Mind, or Understanding; the first, as the universal intelligent Being; the second as the principal Agent, with respect to Generation and Corruptibility; and the last, as Substance incorporeal, and subsisting in the Omniscience of the Supreme Being. He acknowledged, in Fact, that the Creation of the World was the Handiwork of an omnipotent Being; but that he did not mean by the Term Creation, a Creation in a strict Sense; for he imagined, that the Almighty formed and erected the World (if the Expression may be allowed) in a pre-existent Manner, and that it had no Commencement; insomuch that God, the Creator of all Things, acted, in regard to the World that he had made out of a meer Chaos and Confusion, and to the Form and Fashion which he had given to inanimated Matter, no otherwise than as an able and experienced Architect would do, with respect to his Materials of Timber, Brick and Stone, which he orders and disposes of as he sees most convenient for the Erection of a regular and magnificent Palace, or other pompous, tho' more private Structure.

'Tis universally allowed, that *Plato* had some Knowledge of the Supreme Being, or only true God, either from the Light of Nature, or from an Inspection of the Writings of the sacred Pen-men of the *Old Testament*. It must be acknowledged, however, likewise, that there were Numbers of such Philosophers, who (as *St. Paul* expresses it) *having known God, did not glorify him as God*, but were bewildered, and walked in the Dark, following the Dictates of their own vain and foolish Imaginations. In short, he maintained, in his Treatise entituled *Epinomis*, three distinct Deities; that is to say, the superior Gods, middle Gods, and such as were inferior to them both, whom he distinguished by the Name of Demons. In all Probability, *Plato* grounded his Notion of the middle Gods on what is said in the sacred Scriptures concerning the Angels.

Plato likewise maintained the Doctrine of the Metempsychosis, which he borrowed, indeed, from *Pythagoras*, but very greatly improved it, as is apparent from his Dialogues, entituled *Phædrus*, *Phædon*, *Timæus*, &c. Notwithstanding *Plato* published

lished a most excellent Treatise on the Immortality of the Soul; yet he ran into several very gross Errors, not only in regard to the Substance of the Soul, which he imagined to be composed of two distinct Parts; one spiritual, the other corporeal; but with respect to its Origin, maintaining that the Souls of Men were pre-existent, and formed before their Bodies; and that deriving their Being from Heaven, in order to animate, successively, different Bodies, they returned to Heaven after a due Purification; from whence, after the Expiration of a certain Number of Years, they were again employed in animating different Bodies, one after another; insomuch that it was nothing more than one continued Circle or Round of Defilements and Purifications; of Returns to Heaven, and from thence back again to Earth, in those particular Bodies which 'twas their Province to animate. As he was entirely of Opinion, that such Souls never totally forget the various Transmigrations and Scenes of Life, which they had underwent whilst in the different Bodies which they had animated from Time to Time, he conceived, that such Knowledge as they acquired was not new, but a Reflection on, or a Recollection rather of what they knew before; and he grounded these imaginary Recollections on his Dogma, or Tenet of the Pre-existence of Souls.

However, without expatiating any farther on the Doctrines of this Philosopher, which we have transmitted to us but in a very dark and imperfect Manner; we shall only observe, that his Notions on divers important Articles, seemed so novel, and so sublime, that he in reality merited the high and venerable Title which he obtained in his Life-time, namely, that of *Plato the Divine*; and he was, moreover, looked upon by his Successors, after his Decease, but a little lower than one of the Gods. He died in the first Year of the 108th *Olympiad*, in the 81st Year of his Age, and, what is somewhat remarkable, on his very Birthday.

ARISTOTLE

WAS one of the most illustrious Philosophers amongst the Antients, and more remarkable in particular for his most accurate and curious Researches into the hidden Beauties of Nature, than any of his learned, and most inquisitive Predecessors: Nay, his Name is still revered in all the Schools. He was the Son of *Nicomachus*, a celebrated Physician at that Time, a great Favourite of *Amintas*, then King of *Macedonia*, and an illustrious Descendant of *Machaon*, the Grand-Son of the celebrated *Esculapius*. He was born at *Stagira*, a populous City of *Macedonia*, in the first Year of the 99th *Olympiad*. His Father and Mother unfortunately died, whilst he was but an Infant; and his Guardians, to whose Care and Conduct his future Education was entrusted, were too unmindful of the important Charge which they had undertaken. He spent too many Years of his Youth in Intemperance, Riot, and Excess; insomuch that, before he arrived at the Age of Manhood, he had squandered away the greatest Part of that Substance which devolved to him by the Decease of his Parents. Being thus plunged, through his Extravagance, into Misfortunes, he applied himself directly to the Army, in hopes of a genteel and comfortable Subsistence; but soon growing weary of a Military Life, as not being in all respects conformable to his natural Inclinations, he repaired to *Delphos*, in order to consult the *Oracle* there, and know for certain what Station of Life would for the Future prove most to his Advantage. Whereupon, the *Oracle* directed him to go to *Athens* without Delay, and there apply his Mind to the Study of Philosophy with the utmost Attention. At that critical Conjunction, he was but 18 Years of Age. He studied for 20 Years successively in the Academy there under the Instructions of the Divine *Plato*: And forasmuch as, by his former Ill-conduct, he had squandered away (as before hinted) all his Patrimony, he was reduced to the Necessity of acting the Part of a Physician, and vending his medicinal Packets all about the Town, for his daily Subsistence.

Aristotle eat but little, and slept less: He had such an insatiable Thirst after Knowledge, that in order to withstand the

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natural Temptations of Sleep, he always placed a Brass-Bason by his Bed-side, and whenever he laid himself down to Rest, he extended one of his Hands quite out of the Bed, in which he constantly held a leaden Bullet, which, when Sleep had overcome him, would drop down in course into the Bason, and by the Sound thereof instantaneously awake him. *Laertius* assures us, that notwithstanding he had an effeminate Voice, small Eyes, and spindle Shanks; yet he had a Taste for Dress, and affected, whenever he went abroad, to make a grand Appearance.

Aristotle was a Man of deep Penetration, and comprehended at once, without the least Hesitation, the most difficult and abstruse Questions that could possibly be proposed to him. He soon became an Adept, under the Instructions of so able and experienced a Master as *Plato*, and distinguished himself, by his surprising Progress in Learning, from all the Rest of his Brother-pupils. There was no Question, of what Nature or Kind soever, proposed in the Academy, but *Aristotle* was always consulted, before the Debate was ended; notwithstanding his Sentiments were sometimes widely distant from those of *Plato* himself. All the Pupils in general looked on him as an extraordinary Genius; and some of them were so prejudiced in his Favour, that they would prefer his private Opinion before that of their Master. *Aristotle* at last withdrew from the Academy, at which *Plato* was highly disgusted. He could not refrain from treating him as a Truant and a Fugitive; and would frequently complain, that his Pupil was very undutiful, and flew in his Face, like an insolent Chicken, that pecks at her Mother-Hen.

The *Athenians* pitched upon *Aristotle* to act as their Ambassador to King *Philip*, the Father of *Alexander* the Great. *Aristotle* resided for a considerable Time in *Macedonia* accordingly, in order to discharge the important Trust reposed in him. When he had concluded all his Affairs to his Satisfaction, he returned to *Athens*; where he perceived, that *Xenocrates* had been substituted as Academicist in his Absence: Whereupon, he said, that it would reflect on his Character should he stand mute, whilst *Xenocrates* was talking: He instituted a new Sect of Philosophers,

phers, and maintained several Tenets widely distant from those which he had learnt of his Master *Plato*.

The universal Character, which *Aristotle* had obtained, of shining in a distinguished Manner, in every Branch of useful Knowledge, but more particularly in Politics and experimental Philosophy, induced *Philip*, King of *Macedonia*, to invite *Aristotle* to take upon him the important Trust of the Education of the young Prince, his Son. *Aristotle* was at that Time in his Bloom, between 30 and 40 Years of Age. *Aristotle* accepted of that honourable and royal Offer, and acted accordingly in that high Post for eight Years successively; and communicated (as *Plutarch* assures us) to his young Pupil, some particular Points of Learning, which he industriously concealed from all the World besides. As the Study of Philosophy and the other abstruse Sciences had no bad Influence on his Deportment, and had not rendered him in the least imperious or morose; he applied his Mind very closely to the due Administration of all public Affairs; and Nothing of Moment was transacted at the *Macedonian* Court, but what he had a principal Hand in the Execution of it. King *Philip*, out of a peculiar Regard and Affection for *Aristotle*, rebuilt the City of *Stagira*, (which was the very Spot whereon that great Philosopher was born, and which had been laid in Ruins by the then late Wars) and for his Sake generously released all those who had been taken Captives, as well as those who had fled for the Preservation of their Lives and Liberties, to Parts remote.

Aristotle, after he had faithfully discharged his Duty to his Royal Pupil, and taken his Leave, in the most affectionate Manner, of that young, hopeful Prince, returned to *Athens*, where he was received with all the Testimonials of the highest Respect; because King *Philip*, out of Gratitude and Love for his Son's Tutor, had conferred on the *Athenians* several very interesting and important Favours. He pitch'd upon a particular Spot of Ground in the *Lyceum*, to which there was a long Avenue, or Gravel-walk, with a regular Row of verdant Trees on each Side, for the Place of his Residence, and the Establishment of his public School: And forasmuch as it was his constant Custom to improve his young Pupils, by way of familiar Conversation, as they were walking backwards and forwards,

forwards, the whole Sect of *Aristotelians* were afterwards distinguished by the Name or Title of the *peripatetic* Philosophers. The *Lycæum* soon became a Place of public Notice, on Account of the vast Concourse of People both of Learning and Fashion, who resorted thither from all Parts, for the Pleasure as well as Advantage arising from his public Lectures; for his Fame was industriously spread all over *Greece*.

Some time after his Establishment in this Academy, his Pupil *Alexander* desired him to read public Lectures on experimental Philosophy; and for that purpose, gave Orders that a great Number of Sportsmen, as well as Fishermen, should wait on him from all Parts, and furnish him with a Profusion of the most curious Materials for the Objects of his Observation; and sent him, at the same Time, eight hundred Talents in order to defray that extraordinary Expence.

Much about that Time, *Aristotle* published several metaphysical as well as physical Tracts. *Alexander*, who was then in *Asia*, hearing that his Books were exposed to public Sale, being a jealous Prince, and very ambitious of being the greatest Man in the World, in all Respects, was not only highly concerned, but even disgusted, to find, that the profound Knowledge of *Aristotle* was laid open, and made plain and obvious to common Understandings; and communicated his Resentments on that Account in a concise Epistle, which was couched in pretty warm Terms, to the following Effect.

ALEXANDER to ARISTOTLE.

“YOU have acted very indiscreetly, in publishing your
 “ several Treatises on all the speculative Sciences; since,
 “ when the Doctrines and Precepts, which you communicated to
 “ us in private, are at once spread all over the World, we shall
 “ have no Wisdom to boast of above the meanest of our Sub-
 “ jects. I would have you to know, that I had much rather
 “ surpass all others in the Knowledge of some hidden Literary
 “ Secrets, than to be the most powerful Monarch in the Uni-
 “ verse.”

Aristotle, in order to pacify his ambitious Pupil, and to vindicate his past Conduct, returned him the following short, but artful Answer.

S I R E,

SIRE,

“THIS true, indeed, that I have exposed my Works to public Sale; but I have cast such a dark Veil over them, that not one Eye in a Thousand will ever be able to discover the literary Beauties which lie concealed under them.”

By this artful Answer, he plainly intimated, that he had rendered his Doctrines so intricate and confused, that none but a few penetrating Virtuosi would be capable of the least Improvement from his elaborate and profound Instructions.

Aristotle, at last, was not that Favourite with *Alexander*, as he had been for many Years. He fell out with him for espousing, with too much Warmth, the Interest of *Calisthenes* the Philosopher, who was a distant Relation of *Aristotle*'s, and his Niece's Son. *Aristotle*, it seems, had brought him up from his Infancy, under his own Roof, and had all along taken upon himself the Care and Concern of his Education. When *Aristotle* took his Leave of *Alexander*, and the *Macedonian* Court, he recommended this favourite Nephew of his, in the most sanguine Manner, to be an Attendant on that young Prince in his future Expeditions. *Calisthenes* spoke his Mind too freely to his Majesty, and did not act the Part of a parasitical Courtier with a good Grace. It was through his Perswasions, that the *Macedonians* absolutely refused to worship *Alexander* as a God, as was a customary Piece of impious Flattery among the *Persians*.

Alexander, who had conceived an innate Aversion to him, on account of his blunt Deportment, and Want of Complaisance, was determined to get rid of this troublesome Courtier at all Adventures. Whereupon he involved him, as he was not sufficiently upon his Guard, into a Conspiracy, which was first formed, and secretly carried on some Time after, by one *Hermolaus*, a Pupil of *Calisthenes*; and would never suffer him to urge one single Word in his own Vindication. In short, some insist, that *Alexander* caused him to be thrown into a Lions Den; others, that he was executed, by Way of Contempt, as a common Malefactor, on a Gibbet; and others again are of Opinion, that he died upon the Rack.

Aristotle, ever after this ignominious Treatment of his Nephew, looked on his royal Pupil with an Eye of Contempt,

and mortal Hatred: *Alexander*, on the other Hand, studied every Way he could possibly devise to mortify his Tutor, and make him uneasy. Accordingly, he promoted his Rival *Xenocrates*, and sent him several very valuable Presents. At this, *Aristotle* was nettled to the last Degree; and prompted by Jealousy vowed Revenge. Some Historians assure us, that he carried his Resentment to so high a Pitch, as to become an actual Party concerned in the Conspiracy against him formed by *Antipater*, and to give him private Instructions, how to prepare those poisonous Ingredients which were suspected to be the Cause of *Alexander's* Death.

Though *Aristotle*, 'tis true, in most Respects, was a Man of Steadfastness and Resolution; yet 'tis evident, from very authentic Accounts of him, that he had his Foibles, and Infirmities of Nature as well as other Men. Some short Time after he had laid down his Academy, he withdrew to the Court of *Hermias*, the Tyrant of *Atarna*. Some Authors would insinuate, that *Aristotle* was nearly related to that Prince; but others scruple not to assert, that he was criminally enamoured with him, and that he had some View of Interest and Advantage arising from the Payment of that Visit, and the Gratification of that inordinate Passion.

Some Historians again assert, that, not long after his Arrival at *Atarna*, he married the Sister of that Tyrant; but others are of Opinion, that his Spouse was nothing more than One of his cast-off Concubines.

But be that as it will, he was so far transported with the real or imaginary Charms of that young Lady, that he actually offered up Sacrifices to her, with all the Pomp and Solemnity imaginable, and paid her the very same divine Homage, as the *Athenians* did to the *Eleusinian* Goddess *Ceres*; and moreover, composed several poetical and sublime Panegyrics on his Favourite *Hermias* for his sincere Friendship and condescending Goodness in bestowing on him such an angelic Partner.

Aristotle divided his Philosophy into two Parts only; namely, Practice and Theory. The former is that, which lays down (as *Logic*, or the *Art of Thinking* does) those certain Truths, which are best adapted to regulate and command the Operations of the Mind; or otherwise, such other Rules and Maxims for
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the Conduct of human Life as are prescribed us by the best Economists and the most experienced Politicians. The latter is that, which (like *Metaphysics*, or *natural Philosophy*) discovers to us such particular Truths as are merely speculative. According to the Tenets of this great Philosopher, there are three Principles relative to all substantial Things in Nature, *viz.* Privation, Matter, and Form.

In order to demonstrate that Privation ought to be deemed a Principle, he maintains, that the Matter whereof any new Thing is composed must have a Privation of the Form of such new intended Thing. 'Tis absolutely requisite (for Instance) says he, that the Matter whereof any Table is to be composed should have a Privation of the Form of that same Table; that is to say, in other Terms, that before any Table can be made, the Matter whereof it is to be composed, be it what it will, cannot actually be a Table.

He does not look upon Privation as a Principle, in regard to the Composition of Bodies; but as an external Principle only of their Production, in such a Manner, that that Production becomes a Change or Variation, whereby such Matter passes from that State and Condition in which it never was to another that it acquires, as in the before-mentioned Instance, a Block, or Plank of any Kind of Wood whatever, becomes a Table from being nothing like a Table before.

Aristotle gives us two different Definitions of Matter. The first, according to his Notion, is negative; that is, says he, 'tis neither Substance, Extension, or Quality; nor Existence, in short, of any Kind whatever; so that, according to his Idea, the Matter of Wood, for Instance, is neither its Length or Breadth, its Form, its Colour, its Solidity, its Weight, its Hardness, its Softness, its Roughness, its Smoothness, its Aridity or Moisture; its Smell, nor, in a Word, any one other Accident whatever that may possibly attend such Matter of Wood.

His other Definition is affirmative; but not in the least more satisfactory than the former: He insists, that Matter is the Subject whereof a new Thing is composed, and wherein it is at last resolved. Now, according to his Notion, we shall for ever be

at a Loss to determine what the first Subject is, whereof all the Works of Nature are composed.

This same Philosopher insists, that, for the Formation of any natural Body, it is absolutely necessary, it should have another Principle, besides that first Matter, which he calls Form. Some, indeed, imagine, that thereby he means nothing more than the Disposition of its various Parts; others, however, are of Opinion, that he means a substantial Entity, really, and in all Respects distinct from that Matter; and that when any Corn, for Instance, is ground at the Mill, it assumes a new substantial Form, whereby the Corn is converted into Flower; and that afterwards, when Water is mingled with the Flower, the whole is metamorphosed, as it were, and assumes directly another substantial Form, and is then no longer Flower but Paste; and again, when that Paste is thrown into the Oven and duly baked, it becomes at once a new substantial Form, and such baked Paste, in a Word, is metamorphosed into Bread.

These various Sorts of substantial Forms are admitted, indeed by some, in all other natural Bodies; thus, for Instance, in a Horse, besides his Bones, his Flesh, his Nerves, his Brains, his Blood, which, by the Circulation thereof through his Veins and Arteries, nourishes and supports each individual Part of him; and besides all these, the Animal Spirits, which are the Principles and Springs of all Motions; there are some Philosophers, I say, maintain, with him, that there is a substantial Form, exclusive of all the before-mentioned Articles, which, they admit to be the Soul of the Horse; they strenuously maintain, that this imaginary Form is not drawn or extracted from the Matter itself, but the Energy or Power of that Matter: In a Word, they peremptorily insist, that it is an Entity, really and truly distinct from the Matter, whereof it is not any individual Part, or even in the least, any Modification of it whatsoever.

Aristotle still farther maintains, that all terrestrial Bodies are composed of the four Elements; that is to say, of Earth, Water, Air, and Fire; that the two first, being ponderous, naturally inclined to the Center of the World; and, on the other Hand, the two last, being light, keep at as great a Distance from it, as possibly they can. Besides

Besides these four Elements, however, he admits of a fifth, of which all celestial Bodies were composed, and the Motion whereof was always circular. He conceived, that above the Air, though under the Concavity of the Moon, there was a Globe of Fire, from whence all Flames had their Source, and into which they were resolved; as Brooks and Rivers naturally discharge their Waters into the Sea.

Aristotle farther maintained, that Matter was divisible *ad infinitum*; that the Universe was perfectly full, and that there was no such Thing as a Vacuum in all Nature; that the World was eternal; that the Sun had rolled round its Axis from Eternity, as it does at present, and that such Rotation will never cease; that the human Species likewise were subsisting before the Commencement of Time; that had there been any such Thing in Fact as a first Parent, he must have been born without either Father or Mother, which is a direct Contradiction, and perfectly absurd. In the same Manner he argues in Regard to the Birds of the Air: 'Tis downright ridiculous (says he) to imagine, that there was ever one particular Egg, from whence the whole Species of Birds received their Being; or that there ever was one particular Bird that laid the first Egg; because the Bird proceeds from an Egg; but that Egg came from a Bird, and that from another preceding, and so backwards *ad infinitum*. The same Argument is farther made use of by him in Regard to all the other various Species of Animals throughout the Universe.

He maintains, moreover, that the Heavens are incorruptible; and that notwithstanding all sublunary Beings are liable to Corruption, yet the Parts whereof they are composed will never decay; that they only change their Position; that from the Destruction of one, another springs up to supply its Place, and by that Means the whole Mass of the World will continue for ever complete. To this he adds, that the Earth is at the World's Center; and that the first and supreme Being causes the Heavens to roll round that Earth by such certain Beings or Intelligences as are for ever employed in superintending those particular Rotations.

Aristotle insists, that all that vast Expanse, which at this Day is covered over with the Waters of the Ocean, was formerly

merly dry Land; and farther, that what now appears to be dry Land, shall, in Process of Time, be covered with the Waters last mentioned. The Reason that he gives for the Support of this Assertion is this; that the Rivers and impetuous Torrents are continually carrying Sand and Earth along with their respective Currents; by Virtue whereof their Banks are gradually encreasing, and the Sea, though imperceptibly, retreating; insomuch that, since Time never ceases, those Vicissitudes of Earth into Sea, and Sea into Earth again, are continually happening from one Age successively to another without End. He adds, moreover, that in divers Places, remote from the Sea, and on divers Mountains, the Sea, having withdrawn its Waters from them, has left behind a vast Variety of Shells; and that by digging into the Bowels of the Earth, the Workmen have frequently found Anchors, and broken Pieces of Ships. And, according to *Ovid*, *Pythagoras* was of the same Opinion.

Now *Aristotle* insists, that these Alterations from Sea to Land, and Land to Sea, which are thus imperceptibly made, during a long Process of Time, are, in a great Measure, the Reason why the Memory of Things past are so frequently erased. He adds, moreover, that other Accidents sometimes intervene, which occasion the Loss of the Arts themselves; such for Instance, as Pestilences, Wars, Famines, Earthquakes, Fires, or, in a Word, such total Desolations as at once extirpate and destroy a whole City or Country, except some few that escape by Flight into the adjacent Desarts, where they lead a savage Life, and beget, in Process of Time, a new Generation of People, who gradually cultivate those Lands in which they reside, or others, which they casually discover, or revive those Arts, which are above-mentioned to be lost; and that the very self-same Notions are recollected and renewed from one Time to another without End. This is his Way of arguing, and by such Propositions as these, he maintains, that notwithstanding those various Vicissitudes and Revolutions above allowed, yet the Machine of the World subsists without Corruption.

Aristotle, indeed, is very curious in his Researches after those Things which are most capable of rendering Mankind happy
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In this Life. He refutes, in the first Place, all such Libertines, as imagine that Happiness solely consists in sensual Enjoyments. He insists, that they are not only of short Duration, but soon create a Disgust, enervate the Body, and stupify the Brain. In the next Place, he discards the Notion of such as are ambitious, and think that Happiness wholly consists in Pomp and Grandeur, and never scruple the Practice of the vilest and most indirect Means in the Attainment of any Post of Honour and Advantage.

He insists, that Honour and Esteem subsist in the Person who pays that Homage; and adds, that the ambitious Man is fond of being respected for some particular Virtue, which he willingly would have the World believe to be implanted in him; and, by Consequence, that true Happiness consists rather in Virtue, than in Honours and Preferments, which are perfectly extraneous.

He confutes, in the last Place, the Notion of such as are avaricious, and imagine, that true Happiness solely consists in Riches. He insists, that Riches are not to be coveted for their own Sake; since they only render such as possess them, and dread the Thoughts of making use of them, the most miserable Wretches under the Sun; that the only Way to make them become Blessings, is to make a generous Use of them, and by Bounty and Benevolence, to relieve those who are in Necessity and Distress; whereas real Happiness ought to consist in something truly substantial, and of intrinsic Value, which ought carefully to be hoarded up, and never to be parted with.

In short, *Aristotle* was of Opinion, that true Happiness wholly consisted in the most disinterested and impartial Action of the Mind, and in the constant Practice of all social Duties. He insists, moreover, that the noblest Employment of the Mind is the Study of Nature; that is to say, that no Time can be spent more advantageously than in making deep Researches into all celestial and terrestrial Bodies; but more particularly into the Existence of the supreme Being. He observes, however, that no Person can be said to be perfectly happy, without having some competent Portion of the good Things of this Life; for unless we are so possessed, we cannot

not employ our Time on any sublime Speculations, nor in the Practice of any social Duties. As, for Instance, in Case we are poor and indigent, we can have no Opportunity of obliging our Friends; and 'tis doubtless one of the highest Pleasures that this Life affords, to be in a Capacity of doing Good to those whom we sincerely love: And thus, says he, true Felicity consists in three Things; first, in the Faculties of the Mind; such, for Instance, as Wisdom and Prudence; secondly, in natural Perfections; such, for Instance, as Beauty, Strength, Health, and the like; and lastly, in the Blessings of Fortune; such, for Instance, as Riches and Honours. 'Tis his Opinion, that Virtue alone is not sufficient to make a Man perfectly happy; that there is an absolute Necessity for Mankind to be possessed, in some Degree, of the Blessings of Life; and that a wise Man must be inevitably unhappy, if he be either in Pain, or in Distress. On the other Hand, he assures us, that Vice is sufficient of itself to make Mankind thoroughly unhappy; that notwithstanding we roll in Riches, and are possessed of all the Blessings of Life besides, yet still, in Case we are vicious, we can never be happy; that tho' the wisest Man in the World was not totally exempt from Afflictions, yet those Misfortunes were such only as were light and trivial; that Virtues and Vices were not inconsistent Things; that the same Man might possibly be very just and honest, and yet be a downright Libertine in his Heart.

He admitted of three several Degrees of Friendship; the first was that of Consanguinity; the next that of Inclination; and the last that of universal Benevolence.

He was of Opinion, that the Study of the Belles Lettres contributed, in a great Measure, towards the Practice of Virtue, and assures us, moreover, that it was the greatest Consolation imaginable to all such as were highly advanced in Years.

He acknowledges (as *Plato* did before him) a supreme Being, and an over-ruling Providence.

He insists, that all our Ideas proceed originally from the Senses; that a Person born blind could never have any adequate Notion of Colours; nor, on the other Hand, could one that had been deaf from his Birth, have the least Conception of articulate Sounds.

In Regard to Politics, his Notion was, that a monarchical State was preferable to all others, because in all others there were more Persons than one to sit at the Helm of Government; as an Army is more likely to prove victorious when headed by one General, than if there were twenty commanding Officers invested with equal Power; so it is in the Regulation of a Kingdom. Whilst the Deputies or leading Men in a Republic are wasting their Time in Assemblies and Debates, the Monarch has got Possession of the Place he aimed at, and carried his Plan into actual Execution. The Administrators, or Heads of a Republic, are under little or no Concern for its real Benefit and Welfare, in Case they can but promote their private Interest by its Downfal: They soon grow jealous of each other; from whence arise Animosities and Divisions, and so, in Process of Time, the Republic very seldom fails of being ruined and undone; whereas in a monarchical State, the Prince has no other Interest in View but that of his Kingdom; and, by Consequence, his Subjects must be a flourishing People.

Aristotle was once asked, what Benefit and Advantage could possibly arise from the Practice of Lying: Why this, replied he, he that is addicted to that mean-spirited Vice, may be assured, that no one will believe him whenever he speaks the Truth.

Aristotle being once blamed by a Friend, for bestowing his Benevolence on a wicked, unworthy Object; it is not, said he, because he is that wicked, worthless Person, as you observe, that I have Pity and Compassion on him; but because he is my Fellow-Creature.

It was a common Saying of *Aristotle's*, both to his Friends and Pupils, that Knowledge, in Regard to the Soul, was much the same as Light is to the Eye; and that, notwithstanding its Roots might possibly prove somewhat bitter, yet its delicious Fruits made an ample Compensation.

Sometimes when *Aristotle* was disgusted at the Misconduct of the *Athenians*, he would tell them, with an Air of Derision, that notwithstanding they had a Profusion of wholesome Laws, as well as of the best Corn, yet they would be lavish of the latter, without paying the least Veneration or Respect to the former.

Being once asked, what Thing was soonest blotted out of a Man's Remembrance, he made Answer, a grateful Acknowledgment for Favours received.

Another Time being asked what Hope was; 'tis the Dream, said he, of a Man that is awake.

One Day *Diogenes* made *Aristotle* a Present of a Fig; the latter plainly perceived, that in Case he refused to accept of his Favour, the former had some Piece of Raillery ready to throw out upon the Occasion: He took the Fig, therefore, accordingly, and said, with a Smile; Now *Diogenes* has not only lost his Fig, but the Use he intended to make of it.

He used to say, that there were three Articles absolutely requisite for all young Children; that is to say, a natural Genius, Exercise, and Dicipline.

When any one asked him what Difference there was between a wise Man and a Blockhead, he would say, that there was no more than between the Living and the Dead.

He would frequently say, that Knowledge was an Ornament in Prosperity, and a great Support and Relief under the Frowns of Fortune; that those who bestowed a liberal Education upon Children, were in Reality much more their Parents than those who begat them; since the latter only brought them into Life, but the former enabled them to pass away that Life in a happy and reputable Manner.

That a handsome Face, and a graceful Deportment, were Recommendations infinitely more strong than any epistolary Encomiums whatsoever.

Being asked one Day what Measures a Pupil had best take for his most speedy Improvement; he replied, he ought always to have his Eye on those who were his Superiors in Knowledge, and not on those who knew less than himself.

Aristotle hearing a talkative Gentleman vainly boast of his being a Freeman of a very populous and trading City; don't lay, said *Aristotle*, such a Stress on that Article, but reflect within yourself whether you are worthy or not of being a Member of any illustrious Country.

When *Aristotle* reflected on the Life which some certain People led, he would frequently say, that there were some Men who heaped up Bags upon Bags, with as much Avarice and

Concern, as if they thought they should live for ever; and others again, who were as profuse and extravagant, as if they were well assured they should die the next Day.

Aristotle being asked what it was to have a sincere Friend, he replied, to have one and the same Soul in two Bodies.

A certain Person asked him one Day how we ought to deport ourselves towards our Friends; to which he readily replied, just the same as we would willingly have them behave towards us.

He would frequently cry out, Ah! my Friends! There is no such Thing as sincere Friendship in the World.

One Day he was asked why we had more Affection for Persons who were handsome, than such as were ugly or deformed: Friend, says *Aristotle*, you ask me a very blind Question.

When he was once asked what Benefit and Advantage he had reaped from his Philosophy: Why, replied he, a Power to do that of myself, without any Direction, which some others would never practise, was it not for fear of being subject to some penal Laws.

Some Historians assure us, that during his Residence at *Athens*, he had an uninterrupted and familiar Converse with a Native of *Judea*, who instructed him thoroughly in all the intricate Knowledge of the *Egyptian* Hieroglyphics; whilst all others, who were his Contemporaries, were obliged to travel to *Egypt* itself for their Improvement in those religious Studies.

Aristotle, after he had instructed his Pupils for thirteen Years successively in the *Lyceum*, with unblemished Reputation, was charged by *Eurimedon*, one of the Priests of the Goddess *Ceres*, as guilty of blasphemous Expressions. The Recollection of what Treatment *Socrates* had before met with, terrified him to that Degree, that he determined to leave *Athens* at once, and to seek an Asylum at *Chaleis* in *Eubœa*. Some say he died with Vexation, because he found himself incapable of giving a rational Account of the Ebbing and Flowing of the Sea. Other Historians assure us, that he threw himself headlong into the Sea, and said, whilst he was falling; O Sea! bury me in thy Waves, since I can never comprehend thy Motions. Others again insist, that he died a natural Death, in the sixty-third Year

44 BIOGRAPHIA PHILOSOPHICA.

Year of his Age, and two Years after the Death of his once royal Pupil *Alexander the Great*.

The Natives of *Stagira* erected Altars to his Memory, and paid him the Tribute of divine Adoration.

Aristotle made his last Will and Testament, and thereby constituted and appointed his Friend *Antipater* sole Executor.

He left one Son behind him, named *Nicomachus*, and one Daughter, who had been married for some Time to the Grandson of *Demaratus*, the King of *Lacedemon*.

D E M O C R I T U S.

DE M O C R I T U S, one of the greatest Philosophy of Antiquity, was born at *Abdera* in *Thrace*; he was educated by the *Magi*, who taught him *Theology* and *Astrology*; afterwards he heard *Lencippus*, and learned of him the System of *Atoms*, and Doctrine of a *Vacuum*. The extraordinary Inclination he had for Learning, moved him to travel into all the Parts of the World, where he hoped to find some great Men. He went to the Priests of *Egypt*; he consulted the *Chaldean* and *Persian* Philosophers, and went even to *India* and *Ethiopia*, to confer with the *Gymnosophists*. In those Travels he spent all his Patrimony, which was worth about 100 Talents; for which he would have incurred a Note of Infamy, had he not given good Proof of his very great Improvements, by which he ingratiated himself to the Regard and Assistance of his Brother.

It is Matter of Dispute, whether he was ever at *Athens*; but there is a Paragraph in *Maximus Valerius* which implies it. “*Democritus*, whose Fortune was so great, that his Father could with Ease furnish out an Entertainment for *Xerxes*’s Army, gave his Patrimony to his Country, reserving only an inconsiderably Part to himself, to disengage his Mind from every Thing else but Study, which he prosecuted many Years, with great Application, at *Athens*.”

Unobserved, as he owns in his Works, he gave two Proofs of an extraordinary Sagacity. *Democritus* went to visit *Hippocrates*

crates, who called for some Milk, and such was *Democritus's* Skill, either from Smell or Colour, that he positively determined it to be the Milk of a black Goat, that had never had but one Kid.

Hippocrates having also a Female with him, the first Time that *Democritus* saw her he called her a Maid; but the next Day he called her Woman; and it afterward became known, that she had been deflowered the preceding Night. This was greatly admired at by *Hippocrates*. Some assert he had this Knowledge from an Alteration he observed in her Eyes; others say it was from a different Tone of her Voice.

At other Times he discovered peculiar Properties in Vegetables, Fossils, Shrubs, and Minerals, the Effect of his Study and various Experiments. The Weather, Seasons, &c. he made such Observation of, that it enabled him to judge of them with great Accuracy, and probably occasioned the Charge of Magic, of that Magic that's grounded upon Compact with the Devil.

At one Time foreseeing that it would be a bad Year for Olive Trees, he bought up great Quantities of Oil at a low Price, which, notwithstanding it proved true, and he might have made extraordinary Advantage of it, he declined making any Profit, let the Persons have it of whom he had bought it, and contented himself with showing that he could be rich, but that he despised it, and laughed at the Vanity of human Riches.

At another Time he advised his Brother to set all his Reapers to Work, to carry into the Barn what Corn was cut, when the Weather was very fine, and soon after a furious Storm arose: And it is said that he was the first who discovered and demonstrated the Influence of the Heavens on the Earth. This, however, seems indisputable, that he had a fine Genius, a good Understanding, and a penetrating Wit, which by Study, both of natural and moral Philosophy, the Mathematics, and the liberal Arts, he greatly improved, and acquired just Esteem and Veneration in many Instances, as the Inventor or Discoverer of useful Truth; but in other Cases he had his Errors. *Lucian* says he appeared undaunted, because he was fully persuaded the Soul died with the Body.

He also imagined the Air full of Images, and taught others to pray, that such only might present themselves as were agreeable and propitious, and would please and improve.

In his general System of Physics, he was the Fore-runner of *Epicurus*. *Cicero* says, What is there in the Physics of *Epicurus* that is not to be found in *Democritus*? They agree as to Atoms, Vacuum, Images, Infinity of Space, Infinity of Worlds, with their Formation and Dissolution: But he is said to differ in this from *Epicurus*, that he thought there was an animal and spiritual Nature in the Concourse of Atoms, and *Epicurus* believed only an animal; and it is maintained by him, that there was nothing real but the Atoms and Vacuum, and that every Thing else consisted in Opinion only.—This is what the *Cartesians* say now.

He appears to have very imperfect Ideas of the Divine Nature; and he conceived our ultimate End to be the Tranquility of the Mind.

He had an Aversion to Matrimony, and some thought a criminal Dislike to the Fair Sex; but he freely owned he disliked Marriage, as the Increase of a Family, and the Trouble that attends it, was a great Hindrance to Things of greater Consequence. He also said the Pleasure of Love was a little Epilepsy.

What is said of the Displeasure his Servant Maid gave him, by informing him of a Thing for which he was seeking a natural Reason, is curious enough. Thus *Montagne* tells the Story: *Democritus* having eaten at his Table some Figs which smelled of Honey, immediately began to revolve in his Mind what should be the Cause: He rose from Table to observe the Situation of the Place where the Figs were gathered. The Maid hearing the Reason of his rising from Table, told him, laughing, she had put them into a Vessel that had Honey in it: Go, says he, you have vexed me, I shall nevertheless enquire into the Cause.

EUCLID, the Philosopher.

EUCLID, a Native of *Megara*, and Disciple of *Socrates*, did not follow the Taste of his Master; for instead of addicting himself chiefly to the Doctrine of Morality, he set himself to refine the Subtleties of Logic. He founded a Sect, which passed for a Branch, or Continuation of the School of *Xenophanes*, *Parmenides* and *Zeno*. His Opinions are not very well known, being very difficult to comprehend any Thing in his Doctrine of Good. He managed his Disputes with great Warmth and Impetuosity, and many of his Pupils caught too much of the same Fire.

Eubulides, who succeeded him, invented divers Sophisms exceeding captious and perplexing. *Aleximus*, who succeeded him, a great Lover of Dispute, and engaged in it with unreasonable Vehemence. *Diodorus*, another Disciple, became alike intoxicated. If this Sect had contributed much to the Illustration of Truth, it ought to be looked upon as a Prodigy, since nothing tends more to confound and darken Things, and fill the Minds of Readers and Auditors with Doubts, than the Application to the Quintessence and Subtleties of Controversy, managed with too much Heat. This brings near to Truth what *Timon*, the *Philasian*, objected to our *Euclid* and his Followers.

*These Triflers, and their captious Clan, I hate,
Phædo and Euclid, forward to debate;
From them their Country catch'd infectious Rage.*

Among all philosophical Exercises, there is none in which Moderation is more necessary, than in that of Disputation; for no sooner are you passed certain Bounds, but you fall into useless Trifles and Irregularities, which give the Mind an ill Turn, and hinder it from finding Truth. To this may be applied the Words of *Aulus Gellius*, "When I heard or read these, or such like Subtleties, the Produce of an easy, undisturbed Retirement, but found herein no Solidity, nothing that tended to the Improvement of Life, it confirms the Sentiments of *Neoptolemus*, Philosophy has Bounds which it should never pass." Dis-

Disputation has not been ill resembled by the striking of two Flints together, which fetches out the Sparks of Fire. Disputation, well regulated, is of great Use, but it is very difficult to keep that Medium. It is said of *Tacitus*, to his Honour, and what is most difficult, he retained a Mean in Philosophy.

Euclid, and his Successors, cannot be justified for attempting to distinguish themselves by Inventions, which tended only to confound the Mind, and not advance useful Knowledge.

Aristotle says, that they taught there was no Power separate from its Act; that is to say, that a Cause which does not actually produce an Effect has not the Power to produce it. This *Aristotle* has well confuted.

C O N O N, of SAMOS.

CONON, a Mathematician and Astronomer, was of *Samos*, and flourished about the 130th Olympiad. He died before his Friend *Archimedes*, who had a great Esteem for him, communicated his Writings to him, and sent him some Problems, which *Archimedes* received with Approbation, saying, they ought to be published while *Conon* was living, for he comprehends them with Ease, and can give a proper Demonstration of them.

At another Time he laments the Loss of *Conon*, admiring his Genius, and interrogates after this Manner; How many Theorems in Geometry, which at first seem'd impossible, would in Time have been brought to Perfection? Alas! *Conon*, though he invented many, wherewith he enriched Geometry, had not Time to investigate them all, but left many in the Dark, being removed by Death. He had an uncommon Skill in Mathematics, joined to an extraordinary Patience and Application. This is farther confirmed by a Letter sent to *Archimedes* by a Friend of *Conon's*.

“ Having heard of *Conon's* Death, with whose Friendship I
 “ was honoured, and with whom you kept an intimate Correspondence; as he was thoroughly versed in Geometry, I greatly lamented the Loss of a sincere Friend, and a Man of sur-
 “ prising

“prizing Knowledge in Mathematics. I then determined to
“send to you, as I had before done to *Conon*, a Theorem in
“Geometry, hitherto observed by no Body.”

He had some Dispute with *Nicoteles*, who writ against him, and treated him with too much Contempt. *Apollonius Pergæus* confesses it, tho’ he acknowledges that *Conon* was not lucky in his Demonstrations.

He invented a Kind of Volute, which differed from that of *Dynostratus*; but because *Archimedes* explained the Qualities of it more clearly, the Name of the Inventor was forgotten; and instead of being called the Volute of *Conon*, said to be the Volute of *Archimedes*.

As to *Conon*’s astrological Knowledge, it may be in some Measure learnt from the Poem of *Catullus*, who describes it in the Beginning of his Poem on *Berenice*’s Hair, who was the Sister and Wife of *Ptolomy Euergetes*.

Note, that *Conon* was so great a Flatterer, as to give out, that the Hair of that Queen was changed into a Constellation.

*Who scann’d each Object of the stárry Sphere,
Knew when they rise, and when they disappear;
Who knew why Darknèss dims the World’s great Eye,
Why Stars at certain Periods seem to die;
Who knew why Cynthia from her Orb should move,
The Plains of Latmos, and Endymion’s Love:
Conon, the same, who view’d me from that Height,
Whence Berenice spread ætherial Light.*

HIPPOCRATES.

HIPPOCRATES, a Physician, Philosopher, and Mathematician, called in Contradistinction from others, the Divine *Hippocrates*, was born at *Coos* in the first Year of the 80th Olympiad, 458 Years before the Birth of our Saviour, and in the fifth Year of the Reign of *Artaxerxes Longimanus*, and was Cotemporary with *Socrates*, *Herodotus*, *Thucydides*, and other
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great Men of his Time. His Father *Heraclides*, and Grandfather *Hippocrates*, both great Physicians, took Care to teach him, or have him taught not only Medicine, but Logic, Physics, or natural Philosophy, Geometry, and Astronomy: He studied Eloquence under *Gorgias*, the *Leontine*, the most celebrated Rhetorician of his Time, and made many ingenious Improvements in the Sciences, as may be gathered from his Writings, though chiefly celebrated as a Physician.

The Isle of *Coos*, the Place of his Birth, is very happily situated, and had for a long Time been famous for a public School, founded by his Ancestors; he had therefore all the necessary Conveniencies for learning the Theory of Medicine, but as the greatest Cities in those Times were not very populous, so, in order to perfect himself, he followed the Precept which he gives to others in his Νόμος, Law, where he says, that after acquiring the Science of Medicine, it is necessary to travel and visit foreign Countries, in order to be something more than a Physician in Name; for Ignorance, which proceeds from Want of Experience, is but a bad Stock for those who possess it, and an unfortunate Incumbrance by Night and by Day.

He therefore travelled into *Macedon*, *Thrace*, and *Thessaly*, and in making the Tour of those Countries he made a great Variety of curious Observations. He went indeed thro' the greater Part of *Greece*, improving and rendering himself beneficial to Mankind. When the *Illyrians* sent Ambassadors to him to intreat him to come and remove a raging Pestilence, and he acquainted himself with some Circumstances preceding and attending the Contagion, and of its probably spreading into *Thessaly* and *Greece* by the same Winds, he immediately sent his two Sons *Thessalus* and *Draco*, with his Son-in-Law *Polybus*, and several of his Pupils, into different Places, with necessary Instructions, and went himself to the Assistance of the *Thessalians*, from whence he passed to the *Dorians*, and thence to *Phocis*, visiting *Delphos*, where he offered up Prayers and Sacrifices, and passing thro' all *Bœtia*, made his Appearance at *Athens*, behaving himself all the Way like another *Apollo*.

On another more pressing Occasion he delivered the City of *Athens* from the Plague, which had made infinite Ravages, mentioned by *Thucydides*, an Eye-witness, and afterward by

The LIFE of HIPPOCRATES. 51

Lucretius. One Method he made use of, and which is said to be of great Use, was lighting great Fires thro' all the Streets, and directing all Sorts of aromatic Flowers and Drugs to be thrown into it, in order to purify the Air; a Method long before practised by the *Egyptians*, as mentioned by *Plutarch*.

So great was his Reputation, that he was sent for to the Court of *Perdiccas*, King of *Macedonia*, who was thought to be ill of a Consumption; where, after sifting into the Circumstances of it, he discovered that the Love of his Father's Mistress, named *Phila*, was the Cause of it. Soon after *Artaxerxes* inviting him to come and remove the Pestilence which reigned in his Territories, and previously ordered him 100 Talents, with the Promise of some entire Cities, *Hippocrates* regarding those Riches as Enemies to his Country, and a Reproach to his House, he refused them, and returned the Governor this generous Answer, *Write to your Master, that I am rich enough, and that I cannot with Honour accept his Offers, nor go to cure Barbarians, who are Enemies to the Greeks.*

He was sent by the Senate of *Abdera* to cure *Democritus*, who passed with many for a Madman, but he soon undeceived them, finding him no Fool or Madman, (which is too often thought of some who are wise above the common Rank) and being offered ten Talents as a Reward, he gave a further Proof of his Disesteem for Riches, by absolutely refusing it, or any Gratuity.

When the *Athenians* sent *Alcibiades* into *Sicily*, *Hippocrates*, free from the View of Interest, gave his Son *Thessalus* as a Physician to their Army, and no Citizen ever gave a greater Proof of Patriotism, and the Love of his Country, than he did.

When the *Athenians* made Preparation to carry their Arms into the Isle of *Coos*, *Hippocrates* immediately went to implore the Protection of the *Thessalians*, and the neighbouring States, and sent his Son *Thessalus* to *Athens* to endeavour to allay the Tempest which threatened his Country; both Father and Son met with Success, for the timely Preparations for Defence in *Macedonia*, *Thessaly*, and *Peloponessus*, made the *Athenians* hearken to the Remonstrances of *Thessalus*. And as *Pythagoras* taught, that the Way for Mortals to render themselves like the Deity was to speak the Truth, and do Good to all the World,

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this Maxim he adapted, and gave an Example of it in his Life; and which of the two, his Regard to Truth, or doing Good, were most conspicuous, is difficult to say: In Regard to the former, he had so delicate an Idea, that he would not shun to disclose the least Instance of Weakness or Imperfection in himself, and with an Ingenuity, of which none but great Minds are capable; nor in the Practice of his Profession would he favour the least Illusion or Deceit, Subtilty or unintelligible Distinctions; and his laudable Endeavour to do Good to all within his Power is well known to the succeeding Generations, and proclaimed in History.

He desired of the Gods in Recompence for his Labour, neither Riches nor Pleasures, but a long Life in perfect Health, and Success in his Art. This Desire of his is declared in his Oath, and was accomplished in its full Extent, for he lived 109 Years in Soundness of Mind and Body: And he succeeded so well in his Art, that he has been regarded as the Founder of it; for which he received such Honours during his Life, as were scarce ever conferred on any Mortal. The *Argians* erected a Statue of Gold to his Honour; the *Athenians* decreed him Crowns of the same Metal, and conferred a Title of Honour on him and his Descendants, and he has left behind him an immortal Reputation.

Plato and *Aristotle*, the two greatest Geniuses which perhaps ever appeared, followed him as their Master, and made it their Business to explain his Sentiments, to adapt his Aphorisms, to imitate his Example, and to honour and perpetuate his Memory. In short, *Hippocrates* has been always regarded as the most faithful Interpreter of Nature; no less conspicuous for the Impartiality of his Representations, than the Force and Strength of his Genius, improved by all the Methods in his Power, with indefatigable Diligence and Industry, that the Works of *Hippocrates* are to the Physician what the Polar Star is to the Mariner, his Guide and Director. No Wonder then if his Account of Diseases, and the proper Method of Cure, procured the Attention, and attracted the Esteem of the Wise and Sagacious in all Ages; and in all Appearance he will preserve the Glory and Reputation, which more than 2000 Years has been supported, to the latest Posterity.

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Thus does History characterise *Hippocrates*, Prince of Physicians; and if this be thought repugnant to Truth, because the Knowledge of Medicine depends on Observation, that this Knowledge was then in its infant State, and capable of receiving great Advances and Improvement since his Time: This is in some Measure true, but it is equally true and certain, that *Hippocrates* had the Experience and Improvement of some regular Physicians, who preceded him, and conveyed in lineal Descent from Father to Son, till it reached, and centered in this incomparable Genius, which, according to History, was the 18th or 19th Generation. And if to these Circumstances we add his Care, his Diligence, the Length of his Life, his Travels through *Babylon*, *Egypt*, and the *Indies*, we shall easily account for his large Fund of experimental Knowledge. But as he had all the Learning and Science necessary to lay a Foundation for great Atchievements, so he always diligently studied Philosophy, that he might add the *Rationalie* to Experience, searching into the Measure, Motion, Proportion, and Equilibrium of the Solids and Fluids, in Health or Diseases, as may be fully seen in his Book *De Flatibus*, *Natura Hominis*, *de Diæta*, &c.

That he might explore not only the most apparent, but the more remote and hidden Causes of Distempers, he punctually wrote down his Observations in the Course of his Practice in Physick and Surgery, which led him to see the Usefulness of Anatomy, and engaged him, with great Application, to study the whole Animal Machine, which was attended with great Advances. This is fully evidenced from his Book *De Fistulis*, *de Articulis*, *de Vulneribus Capitis*, &c. and many others, mentioned in *Le Clerc's History De la Medicine*. Many of his Writings are translated into Variety of Languages, and universally celebrated. A short Compendium of his general Principles, Aphorisms, &c. with References to his various Works, are now extant, published by Sir *Conrad Springell*, printed at *London* in 1735.

He died at *Theffaly* in the 2d Year of the 107th Olympiad, 349 Years before the Birth of Christ, and was buried between *Lorriſſa* and *Gortona*.

E U D O X U S.

EUDOXUS, of *Cnidus*, the Son of *Æschines*, flourished in the 97th Olympiad. According to *Eusebius*, he was an Astronomer, Geometrician, Physician, and Legislator. *Archilaus* taught him Geometry, *Plato* Philosophy, according to *Appus* of *Alexandria*, and *Philiston*, of *Sicily*, the Knowledge of Physics; and as he was desirous of making the greatest Improvements in Knowledge, he travelled into *Egypt* with *Chrysippus*, a Physician, carrying with him Letters of Recommendation from *Angefilaus* to *Nectabis*, and there conversed with the most learned and judicious, in which Time he wrote his History of eight Years, and probably his Elements of Geometry.—From hence he went to *Cyricus*, and to *Propontis*, teaching Philosophy, &c.

At his Return Home from his Travels, his distinguished Accomplishments, and his superior Capacity, were so conspicuous, and so ingratiated him into the Love and Esteem of his Country, who advanced him to senatorial Dignity, placed him as their Legislator, and yielded a due Deference to his Injunctions. He discovered a very great Knowledge of the Sciences, and wrote on some with great Accuracy, tho' few of his Writings were preserved.

He died, greatly regretted, about the Year of *Rome* 401, in the 107th Olympiad.

E U C L I D.

EUCLID, the celebrated Mathematician, according to the Account of *Pappus*, was born in *Alexandria*. *Proclus* says he lived in the Reign of *Ptolomy Sagus*, King of *Egypt*, who began to govern about 300 Years before the Christian *Æra*.

He was the first who set up a Mathematical School at *Alexandria*, where, from his Time, till the Conquest thereof by the
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Saracens, all the eminent Mathematicians were either born, or studied; and it is to *Euclid*, and his Scholars, we are beholden for *Eratoſthenes*, *Archimedes*, *Apollonius*, *Ptolomy*, *Theon*, &c.

He was a Perſon of a courteous and agreeable Behaviour, and was in great Eſteem and Familiarity with King *Ptolomy*, who once asking him, whether there was any ſhorter Way of coming at Geometry than by his Elements, is ſaid, as *Proclus* teſtifies, to have made Answer, there was no other royal Way or Path to Geometry.

His Works, as we learn from **Pappus* and †*Proclus*, are the *Elements*, *Data*, *Introduction to Harmony*, *Phenomena*, *Opticks*, *Catoptricks*, a *Treatiſe of the Division of Superficies*, *Porifms*, *Loci ad Superficiem*, *Fallacies*, and *Four Books of Conicks*.

The *Elements*, as commonly publiſhed, conſiſt of 15 Books, of which the two laſt, not without Ground, are ſuſpected by ſome not to be *Euclid*'s, but a Comment of *Hypſicles* of *Alexandria*, who lived 200 Years after *Euclid*, which is probable from their Want of that Concifenefs of Demonſtration as runs thro' the reſt.

They are divided into three Parts, viz. the Contemplation of Superficies, Numbers, and Solids; for, 'as *Proclus* obſerves, *Euclid* has given us no expreſs Diſcourſe of Points and Lines in his Elements. The firſt four treat of Planes only; the fifth of Magnitudes in general; the ſixth of the Proportion of plain Figures; the ſeventh, eighth, and ninth give us the fundamental Properties of Numbers; the 10th contains the Theory of commenſurable and immenſurable Lines and Spaces; the eleventh, twelfth, thirteenth, fourteenth, and fifteenth, treat of the Doctrine of Solids.

It is paſt Doubt, that, before *Euclid*, Elements of Geometry were compiled by *Hippocrates* of *Chius*, *Eudoxus*, *Leon*, and many others, mentioned by *Proclus*, in the Beginning of his ſecond Book; for he affirms that *Euclid* new ordered many Things in the Elements of *Eudoxus*, made many Things in thoſe of *Theatetus* more complete, and beſides ſtrengthened ſuch Propoſitions as before were too ſlightly, or but ſuperficially eſta- bliſhed, with the moſt firm and convincing Demonſtrations.

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* *Collectiones Mathematic. Lib. 7.*

† *Comment on Euclid.*

On the other Hand, some are of Opinion, that *Theon* had a Share in modelling and disposing these Elements, and making some Addition to them, as we are assured from his own Words in his Comment on *Ptolomy's Almagest*, that the last Proposition of the sixth Book, with the Demonstration, is his; and perhaps are many *Lemmata*, and some Propositions of the tenth Book, neither is it unlikely but some Definitions and Axioms, such as Axiom 10 and 11, have him, or some other for their Author.

Be this as it will, it is of little Consequence. We have the Work; a Work, whose Propositions have such an admirable Connection and Dependance, that take away but one, and the whole falls; whose Method is the most just, admitting and advancing nothing without a Demonstration, and no Demonstration but from what foregoes, and these so convincing, elegant, and perspicuous, that it is beyond the Skill of Man to contrive better. Here the most artful and diligent Carpers have never been able to set Footing. The *French*, who have of late attempted to compile new, have apparently made Alterations for the worse. This is the happy Empire wherein Truth has had an uninterrupted Reign for more than 2000 Years. 'Tis from hence the Heroes of the geometrical World receive Force to vanquish the Obstinate and Ignorant, and extend their Dominions.

One Objection against them indeed is, that some Propositions are demonstrated that were self-evident, and so might have been thrown among the Axioms.* Here I answer, that *Euclid*, on the contrary, is rather to be commended and admired than blamed; for no Care can be too great in establishing the first Principles of a Science: It is far better to have several redundant Demonstrations than one to be wanting, whereby the Learner will proceed with less Suspicion, Fear, and Hesitation, and his Faith not detained, and his Mind kept back with a Multiplicity of Suppositions, nor at all accustomed to take Things upon Trust: It is besides most pleasant and useful to shew the Coherence and Dependance the first Propositions of the Elements have on each other; and if *Euclid* be censured for this, these acute Gentlemen must have likewise to deal with
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* *Peter Ramus, Schol. Mathemat. Lib. iii.*

the whole Body of the antient Geometricians, the great *Apolonius*, *Dr. Barrow*,* *Wolffius*, &c.

Euclid's Definitions are sometimes censured as not plain and intelligible, or not conveying clear and distinct Ideas: This may sometimes arise from want of a Capacity to discern, or a Disposition to Criticism; though this is not always the Case. *Taquet* censures his Definition of Parallel Right Lines; the true Sense of it is generally apprehended, though a more concise one is possible; at present Lines which no where incline to one another are called Parallel.

The next Thing remarkable is the Definition of the fifth Element, specifying the Condition that four Magnitudes in the same *Ratio* must have, which is greatly opposed, and even by some modern Writers. *Taquet* says,† it does not explain the Nature of equal *Ratios*, but only a Property of them, and would have it first demonstrated, that such Properties attend equal *Ratios*; saying withal, it is an uncommon Theorem of a remote and obscure Nature. *Borellus* says, we know not whether four Magnitudes in Nature can be found having such a Property as that mentioned in the Definition, neither can these Comparisons of Infinities be understood; and *Euclid* was so apprehensive of this, that he made use of another Definition of the Proportionality of commensurable Magnitudes, in the seventh Book; neither can we get from it, says he, this small Truth, *When four Magnitudes are proportional, and the first exceeds the second, the third must necessarily exceed the fourth.*

These are the most material Objections made against our Master's Definitions, by the aforesaid ingenious Persons, which have mostly proceeded from the Want of duly considering the Nature of it; and however plausible the Objections may appear, yet notwithstanding the Definition is very good, of excellent Use, and wisely adapted to the Business of Proportionals, most of the chief and general Properties, as also the Proportionality of particular Quantities being immediately directed, briefly and elegantly deduced from it.

Euclid, from the Greatness of his Penetration into the mathematical Sciences, was sensible of the Fitness of those Problems he

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* Lect. V. Mathemat.

† Geom. Lib. V. Part I.

laid down as the Ground and Foundation of it, and of their more extensive Usefulness in other Parts of Literature; that he frequently and strenuously recommended this Study as of very great Importance; that very few wanted Capacity (if they would but attend to it) to understand so much as would be exceedingly advantageous; and lastly, that the Pleasure which would result from a progressive Improvement therein, would abundantly more than compensate the fancied Trouble: To the same Purpose *Plato* writes; but History is silent as to the Death of this celebrated Mathematician.

T H E O P H R A S T U S.

THEOPHRASTUS, of *Eresus*, a Philosopher, the Son of *Melanthus*, in whom very early was discovered a quick Apprehension, and an admirable Acuteness, with a Genius capable of great Improvements in Knowledge, and equal Industry to obtain it. He placed himself first under the Tuition of *Lucippus*, but soon after became the Pupil and Disciple of the celebrated *Plato*, who admiring his Readiness to investigate the Nature and Properties of Things, bestowed on him very high Encouragements, and especially for the divine Eloquence of his Speech, wherein he exceeded all his other Disciples: He was for these Reasons recommended to, and highly ingratiated into the Esteem of *Aristotle*, under whom also he became a Student and an Auditor; and after he had made some Proficiency under his Direction, was at the Request of the Students in his School appointed (by *Aristotle*) his Successor. This we find was in the second Year of the 114th Olympiad; according to *Pliny* he flourished about the 440th Year from the Building of *Rome*.

Thus *Theophrastus* was qualified, and undertook the Government of perhaps one of the greatest philosophical Schools in the World: The Number of those who came to hear him, according to *Laertius*, were two thousands, and according to *Suidas*, many more. He conducted himself in his Profession with great

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Economy, appropriating certain Hours to particular Purposes. He discoursed in such an affecting Manner, and adapted his Gesture so suitably to the Argument whereof he treated, as gained him great Esteem.

In the fourth Year of the 118th Olympiad, *Sophocles*, a tragic Poet at *Athens*, Son of *Amphiclides*, procured a Law to prohibit philosophical Schools. On this Decree *Theophrastus* and others quitted *Athens*: *Theophrastus*, however, did not absent himself long, but returned the Year following, when *Philo* accused *Sophocles* that he had acted contrary to Law, whereupon the *Athenians* reversed their Decree, fined *Sophocles* five Talents, and reinstated *Theophrastus* in his School.

During the intermediate Time he had not been idle, but had made Collections of Money for the more private Conventions of Philosophers, and Encouragement of Learning; and from his close Application to Study, made great Improvements; for he wrote on a great Variety of Subjects, as *Laertius* mentions, with great Learning and Penetration, particularly of the Nature of Animals, Fossils, Metals, Physics or natural Philosophy, Ethics or moral Virtue, Politics, &c. though few of his Writings are now extant. His Treatise of Fossils is still extant, which was lately translated by Mr. *Hill*, and to which we refer the Curious; only observing, he had so far investigated the general System of the Fossil World, as might be presumed possible at the Time he wrote, more than 2000 Years since, when the Sciences to which the present Age owes its Improvement were so little understood, and so few of the Experiments which have now given Light into it had been made.

Plutarch mentions to his Honour, his Love of his Country, and that he had twice freed it from the Oppression of Tyrants.

His Characters of Virtue and Vice are in general esteemed very just; they are still extant in *Greek*, and translated into *French* by Mr. *de la Bruyere*.

In his own Life he exhibited many of the Virtues he recommended, particularly Temperance and Beneficence.

He greatly recommended to his Pupils the Employment of Time, saying, nothing was so precious as Time, and that to lavish it was the greatest Prodigality.

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He discovered a great Contempt of Riches; and bemoaned the Shortness of human Life, as insufficient for attaining great Perfection in Literature.

He died at *Athens* in the 85th Year of his Age, greatly esteemed, the whole People of *Athens* following him to his Grave.

E P I C U R U S.

EPICURUS, one of the greatest Philosophers of his Age, was born at *Gargettium* in *Attica*, the 3d Year of the 119th Olympiad. His Father *Neocles*, and his Mother *Cherestrata*, were among those Inhabitants of *Attica* whom the *Athenians* sent into the Isle of *Samos*: This is the Reason why *Epicurus* passed his Youth in that Island, and did not return to *Athens* till he was 18 Years old. He did not design to settle there; for at the Age of 23 he went to his Father at *Colophon*, and afterwards travelled and sojourned in several Places, before he settled at *Athens*.

When about 36 Years old, he set up a School there, in a fine Garden which he purchased, and there passed his Time with his Friends in great Tranquillity, and taught a great Number of Disciples, observing so good Œconomy, that few Societies were so well regulated.

The Respect his Followers paid to him while living, is greatly to be admired, his School being never divided, and his Doctrines and Precepts highly revered; so that his Memory was perpetuated with great Esteem; and the Books he wrote, which were many, regarded as Oracles.

He brought the *atomical* System into great Reputation: He was not the Inventor of it, but he made some Alterations in it, though not always for the better; for Instance, he spoiled the System in not retaining *Democritus's* Doctrine touching the Soul of Atoms.

Democritus is said to differ from *Epicurus* in natural Philosophy: The former imagines there is an animal or spiritual Nature in the Concourse of Atoms; whereas *Epicurus* allows nothing

thing but Atoms in the Principles of Things. To pretend, that a Collection of inanimate Atoms can be a Soul, and can emit such Images as occasions Thought, is an absurd Hypothesis: However, this *Epicurus* imagin'd, and he would allow nothing but Bodies to think, and in order to make them capable of Thought, he says, that Images flow from those Substances, which he supposes form'd of Atoms, and insinuate themselves into the Mind, as being of a more subtle Contexture than those that present themselves; but if we once suppose that Atoms have a Soul, we may easily conceive that their several Combinations form divers Species of Animals, divers Manners of Sensation, and divers Combinations of Thought.

He also attributed to the same Cause the Formation of innumerable Worlds. He conceived of God as a material Being, (consequently of some Form) though not of the same Kind or mutable Matter, but independently happy and immortal, and whose Residence, he conceives, is not in any particular World, but beyond the Limits of them all.

*Where Show'rs nor fall, nor Winds unruly blow,
Where neither blasting Frost, nor hoary Snow,
Rifle the Place; but Heav'n is ever bright,
Spreading his glorious Smiles with chearful Light.*

Seneca wrote him an Epistle on the particular Opinions he held,* particularly concerning God, wherein he reminds him, that the Doctrine of the fortuitous Concourse of Atoms divest God of his Power and Goodness, and that consequently, we lie under no Obligation to him. If I ask, wherefore you love him? You answer, for the Majesty and Excellence of his Nature. Be it granted, that neither Interest nor Expectations are your Motives to worship him, there is something of Dignity in

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* *Augustine*, and other antient Historians, have controverted *Epicurus's* Notions of God, sometimes expressed in the Singular, and at other Times in the Plural. *Diogenes Laertius* says, he taught us to believe of God, that he was perfectly happy and incorruptible, and to ascribe nothing to him repugnant to Bliss, or incompatible with Immortality; and the learned *Gassendus*, who has given the largest Account of his Works, has taken great Pains to prove his Ideas of God were not at all impious.

the Generosity with which you are influenced; but nevertheless greatly absurd. And indeed he always expressed a Diffidence of his own Understanding; for which Reason, probably, we find it was his usual Method to recommend to his Disciples, as their first and principal Study, the Immortality and Felicity of God.

But however erroneous his Sentiments were, *Seneca* says, his outward Religion was never called in Question, though he did not conceive of God as the Source of all Good, and the Center of all Happiness: He always entertain'd a high Veneration of the Supreme Being, inculcated the same on his Disciples, and expressly forbid attributing any Imperfection to him, or Want of independent Felicity, saying, "he is not an impious Man who rejects the Gods whom the People adore, but he who entertains such impertinent Opinions of them as some People do."

He believed the Supreme Being had a Right to be adored for the Excellency of his Nature, and that we ought to worship him neither from the Hopes of any Reward, or Fear of Punishment; he highly blaming Superstitions, with which the People were abused, and were too often made use of as a Pretence for, or Extenuation of the greatest Enormities.

He greatly exploded the Idea of God's Residence in particular Places, saying, we must not believe them to resemble the finest Palaces in this World; that the Gods, by Reason of the fine Matter of which they are made, are invisible to the Senses, and can hardly be perceived by the Eye of the Mind; and it must necessarily follow, that the Place of their Abode must bear some Resemblance to the Tenuity of their Nature.

He also held, that the Universe was boundless; that this great All had neither Middle nor End; and that from any imaginary Point, the Space you had to traverse was infinite, that there was no End of it.

And as the Subjects of his Enquiries were many, and Philosophers were divided very much in the Criterion of distinguishing what is true from what is false, he made this a Subject of Importance, and accordingly makes the Senses the Standard of Judging, and that we know nothing but by their Report, or by what is inconsistent with them.

He believed there was nothing more great and noble than the Study of Philosophy; that young Persons could never begin it too soon, and that they who were old ought never to be weary, since the End proposed thereby is Happiness, the only End which all reasonable Beings ought to have in View.

And he placed the *Summum Bonum*, or chief Good, in Pleasure, not in infamous and unlawful, but in Pleasure inseparable from Virtue, such a State of Happiness as may be attained by the Strength of Nature in general; in the Tranquility of the Mind. Sometimes Health of Body he joined with it, but chiefly in the former, in regard the Goods of the Mind were better than those of the Body; and therefore he styles Philosophy the Medicine of the Mind.

This by no Means proves, that *Epicureans* place Happiness in good Cheer, or an Intercourse of the different Sexes; for at best, these are but efficient Causes of some Degrees of Satisfaction, which are not here in Question. When there is Occasion, he says, to treat of the efficient Causes of Content and Pleasure, they will mark out the best; on the one Side they will direct you to those Objects which are most capable to preserve the Health of your Body; and on the other, will point out what has the greatest Tendency to the Tranquility of the Mind: Consequently, they will prescribe you Sobriety, Temperance, and the checking the tumultuous Passions, which deprive the Soul of its State of Felicity. These were the governing Maxims with this Philosopher.

Nevertheless, some of his Disciples degenerated, and gave Occasion for mistaken Notions concerning their Master, though his whole Time was devoted to the Study of Philosophy, and he always exercised the utmost Temperance.

He taught, that Virtue was the only Means of making Life happy; because nothing is more pleasant than to live wisely, according to the Rules of Prudence, Honour, and Justice, to have nothing to reproach us. To injure no Man, to do all the good Offices in our Power to our Fellow-Creatures; this, he says, is Pleasure; this is Happiness.

He incessantly recommended Temperance and Sobriety, as the only Way to preserve the true Use and due Exercise of the governing

governing Faculties, as tending to the Health of the Body, and to the repairing it when decay'd.

He considered the Senses in their due Use, administering to Pleasure; but, he said, though Pleasure is desirable, yet we cannot keep it at too great a Distance, when the Evil that will follow will be superior to the Satisfaction enjoyed; and cautions us to avoid such Pleasures that attach us to Bodies.

Some of his Maxims of Temperance, Sobriety, &c. being so perfectly agreeable to his Life, we may remark the following, viz.

Never covet Delicacies; that which is plain and simple will not offend the Head.

He most enjoys Riches that least wants them. If you live according to Nature, you will never be poor; if according to Opinion, you will never be rich.

They live ill, who are always beginning to live; there is no living pleasantly without living virtuously.

He said, there were few who knew how to make a right Use of Life; that the Generality of Men were dissatisfied with their present State; every one proposed to live more happily for the Time to come, but were surprized by Death before they could put their Projects in Execution; and that this was the Thing that made Man's Life so extremely miserable: This being the Case, it was best for a Man to enjoy the Time present, without deferring it to uncertain, future Time, nor measure Life by the Number of Years, but by the Pleasures he enjoyed; for a short and pleasant Life, he said, was more desirable than a longer, full of Care; as at an Entertainment, we do not chuse the most in Quantity, but the Meat that is sweetest, and best drest.

As he rejected the Notion of Fate, he look'd on the Art of Divination as a ludicrous Thing; believing it impossible for any one to know those Contingencies, which having no necessary Cause, absolutely depended upon the Humour and Choice of Man.

Though Epicurus's Notions concerning God and the Soul, &c. were the just Ground of Censure, all Historians in gene-

tal agree, he lived a most exemplary Life, according to the Rules of philosophical Wisdom.* *Cicero* cries out, in his *Tusculan Questions*,

O good Gods, how great was his Abstinence!

St. *Jerom* bestows great Commendations on his Life, and objected it to Christians, to make them ashamed of their Debauches: And *Seneca*, tho' a Stoic, speaks honourably of him.

St. *Gregory* gives us an illustrious Testimony of the Chastity of this Philosopher.

Epicurus tells us, says this Father, that Pleasure was the End of Man; and that we might not imagine the Pleasure he meant was sensual, he lived a Life no less regular than temperate; and confirmed the Truth of his Doctrines by the Purity of his Morals.

His personal Character was eminent for Candour and Sincerity: He was courteous and affable to all, and had that Tenderness for his Friends and Pupils, as would be quite tedious to particularize: He recommended to them Generosity and Kindness, even to their Slaves, and by his own Example inculcated Humanity: He not only permitted his Slaves the Liberty of learning Philosophy, but took Care to instruct them, as if they had been Scholars.

We must not forget how justly he is commended for the Love of his Country and Disciples; he did not abandon it at the Time of the greatest Distress, whilst *Demetrius* besieged *Athens*, but shared the Miseries of his Countrymen, and divided his scanty Diet equally with his Disciples; and many of his Disciples from other Places, who resorted to his House, resided with him as a Kind of Community; each out of his Superfluity shared with his Neighbour, tho' not as one common, or Bank Stock, which might occasion Mistrust.

M. Tully speaks of his constant, undissembled Friendship, with distinguishing Epithets of Commendation, and as the peculiar Honour of his Sect.

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* Among those who misunderstood, or disapproved his Sentiments, they usually used this Distich:

*His Practice with his Doctrine disagreed;
Strict was his Life, tho' Pleasure was his Creed.*

His Submission to Governors is also recorded to his Honour ; he put up Vows for the Safety of the Common-wealth, and the antient Form of Government, but complied with the present State of Affairs, and submitted to those who had the Fortune to govern ; never chusing to be concerned in the Government of the Republic, but preferred a Life of Peace and Tranquility to that Trouble and Perplexity which are inseparable from State Affairs.

Thus advanced beyond the usual Period of human Life, the 72d Year of his Age, he fell sick at *Athens*, where he had never discontinued his Instructions. His Distempers were a Retention of Urine, and *Dysentery*, which were exceeding painful to him ; however he bore them with Patience invincible.

When he perceived his End approaching, he gave his Slaves their Liberty ; and ordered his Birth-day to be annually kept on the 10th of *Gamelien*, or *January*.

He left his Garden and Books to the Use of Scholars that should successively attend there ; and wrote after this Manner to *Idomeneus*.

“ I Am come, I thank the Gods, to the last and most happy Day of my Life. I am tormented with violent Pain, yet even in the Midst of these my Sufferings, I feel a Spring of Joy within me, when I reflect on the Service I have done to Philosophy in general, and the Remembrance of our Friendship. Take Care of the Children of *Metrodorus*, and bear my Doctrines in your Mind.

“ Farewel.”

Having been ill about 14 Days, he went into a Bath of hot Water ; he called for a Glass of Wine, which he drank, and soon after expired, in the first Year of the 127th *Olympiad*, 271 before the Christian *Æra*.

Public Statues were erected to his Memory at the Charge of the City of *Athens*, which, with other Marks of Esteem, testify his distinguished Merit ; and his Writings for many Ages since proclaim his great Penetration, and amiable Character.

Thus

Thus the Poet:

*When Epicurus rose, when he began,
That Oracle of Truth, that more than Man;
The Fame of whose Inventions still surviv'd,
And rais'd an everlasting Pyramid,
As high as Heav'n, as Earth the Basis wide.
For he, observing some that could supply
Contented Nature's thrifty Luxury,
Happy in Honours, and in Wealth's Embrace,
And doubly happy in a noble Race,
Still groan'd and pin'd, with Care and Grief oppress'd,
Each found a sad Disturber in his Breast;
Imagin'd right, the Fault lay hid in Man,
Whence this Corruption of his Joys began:
Because his Wish is boundless, vast his Mind,
Much Good pass thro' and leave no Sweets behind;
Or else, some ill Opinion still destroys
The present Good, and sours all his Joys:
Then he, the mighty he, by pow'rful Rules,
And true Philosophy, reform'd our Souls;
He purg'd away all vain and empty Care,
And taught what Man should hope, what Man should fear;
The End at which we ought to aim he show'd,
And taught an easy Way to find the Good.*

*Thee, who hast Light from 'midst thick Darknests brought
And Life's Advantages and Pleasures taught;
Thee, chiefest Glory of the Grecian State,
Thy Paths I'll trace, resolv'd to imitate.
Thou, Parent of Philosophy, has shewn
The Way to Truth, by Precepts of thy own.
Thee, who hast taught the World Delight and Peace,
Fame shall attend, thy Praise shall never cease.*

LUCRETIVS.

Again,

*Great Epicurus died, his Life's Race run,
Whose Wit Mankind exceeded, as the Sun
Eclipseth, by his Rising, all the Stars.*

A R A.

A R A T U S.

ARATUS, the Philosopher and Poet, by way of Distinction from *Aratus*, the General, was born at *Soli*, a City of *Cilicia*, and flourished about the Time of *Ptolomy Philadelphus*, (according to *Suidas*) in the 124th *Olympiad*, was remarkable for his Quickness of Wit, and Solidity of Judgment.

By these Accomplishments, he was early introduced to the Favour of the King, and spent most of his Time in the Court of *Antigonus Genatos*, the Son of *Demetrius Poliorcetes*. Here he had great Opportunities of improving himself, which his Genius was so naturally adapted to, that it enabled him to make very curious Researches into the Works of Nature; and from Nature up to Nature's God, whom he acknowledged, in those early Ages of Ignorance, the Creator of all Things.

To this Poet *St. Paul* alludes, when discoursing on the Being and Perfections of God, to the *Athenians*, *Acts* xvii. 28. *As certain also of your own Poets have said, We are also his Offspring.*

This Quotation of the Apostle is the fifth Verse of his Poem; beside which, in the Beginning of this Poem are several remarkable Expressions concerning the Deity. His first Words are, *We begin from Jove*, whom we ought never to pass by unmentioned; *for all Things are full of Jove*; Men, Earth, Sea, and every Thing, every where, stand in Need of *Jove*; for *this benevolent Deity supplies them with all good Things*; with several other Expressions, importing his Reverence of the Deity, whom he alway considers in the singular Number, and as the one supreme Governor of the World.

From his assiduous Disposition to enquire into the Nature and Properties of Things, he made many useful Discoveries, and published many of them in his Poem entitled *Phænomena*, or the Appearances of Nature, but more particularly of the celestial Bodies, &c. and his *Diosemia*, which were so pleasing to *Cicero*, *Claudius*, and *Germanicus Cæsar*, that all three translated them into *Latin*: He also wrote Hymns to the God *Pan*; he

he likewise wrote some Things in Medicine; as also, a Treatise concerning Manners; and some Epigrams upon *Antigonis's* Wife: And not only those who were his Contemporaries esteemed and valued his Lucubrations, but many learned Men, in divers Ages of the World, have bestowed Commendations upon these Pieces, particularly Sir *Edward Sherbourne*, *Vossius*, &c. And as his Principles relating to the Deity were regulated by the most natural and consistent Idea of Things; so his moral Character was uniformly virtuous, suitable to what he inculcated on others, and to the Idea of his derived and dependent State, which afforded a lasting Credit and Honour to his Memory.

History is silent with regard to the particular Time and Manner of his Death. Authors are inclined to think he did not arrive to old Age, but exchanged this Life in a somewhat early Period.

P R O C L U S.

PROCLUS, denominated, from his Country, *Lycius*, was a Disciple of *Syrianus*, a Philosopher of the *Platonic* Sect, and presided over a School at *Athens*. He wrote many learned Commentaries on Philosophy, Mathematics, and Grammar; upon the whole Works of *Homer*, *Hesiod*, and *Plato's* Books of the Republic: He wrote likewise concerning the Construction of the *Astrolabe*. He flourished in the Time of *Trajan* the Emperor, and wrote many Things against the Christians after *Porphry*; but was answered by *John*, called the *Grammarian*, in his Apology for the Christians.

We learn from *Suidas*, and *Philostratus*, that there were many of his Name; but *Proclus* the Mathematician is the only one whose Works are extant: The principal of which is his Book on the *Doctrine of the Sphere*; in which he treats of the *Axis* and *Poles* of the World; of the *Circles* of the *Sphere*, great and small; of the *Parallels* of the *Colures*; of the *Zodiac*, and its *Signs*; of the *Horizon*; of the *Meridian*; of the *Galaxy*,

laxy, or Milky Way; of the Constellations; of the five Zones; of the Climates; and the Constellations of the Heavens.

It is not certain how long he lived, or when he died. His above-mentioned Book is deservedly reckoned one of the best Pieces of *Astronomy* among the antient *Greek* Authors, and is worthy the Perusal of the Curious in ancient Learning of that Kind.

C L E O M E D E S.

CLEOMEDES is another *Greek* Author, who though he has wrote a large Treatise of the *World* in general, and *Astronomy* in particular; yet we find no Mention made of him among Authors, neither as to the Age in which he lived, or of what Profession or Sect he was. It is only said of him, that he wrote a very elegant Treatise, which is still extant, and is divided into two Books: The first of which treats of the *Magnitude* and *Dimensions* of the *Earth*; of the *Celestial Circles*, or *Divisions* of the *Heavens*; of the *Motions* of the *Planets* and the *Stars*; of the *Zodiac*, and *Celestial Signs*; of the *Torrid*, and other *Zones*; of the *Encrease* of *Days* and *Nights*; of the *Earth*, as a habitable *Globe*; that the *World* is round; that the *Earth* is in the *Middle* of the *World*; and of the *Magnitude* of the *Earth*. In the second Book he treats of the *Quantity*, or *Bulk* of the *Sun*, and again, of the *Magnitude* of the *Earth*; also of the *Magnitude* of the *Sun*, *Moon*, and *Stars*; of the *Nearness* of the *Moon* to the *Earth*; of the *Eclipses* of the *Moon*; and lastly, of the *Planets*. He tells us, that many Things which he wrote in this Treatise were extracted from *Possidonius*; but tho' these Names were great among the *Ancients*, yet their Writings must appear very sterile, and their Notions very imperfect and vague, to a Person versed in the *modern Cosmology*. However, this Piece of *Cleomedes* must be reckoned among the pompous Remains of Antiquity, and well deserves a Place in the Library of the Curious.

D I O N Y S I U S.

Dionysius Periegetes must not be overlooked, as he is intitled to a Place in our *Biographia Philosophica*, on Account of a Greek Poem which he has wrote, upon a geographical Description of the Surface of the whole Earth, as far as it was known in his Time. He lived in the Reign of *Augustus*, and of Course could treat only of the three great Parts of the World which were then known, which he reckons in this Order, viz. *Lybia*, i. e. *Africa*, *Europe*, and *Asia*.

Priscian translated his *Greek Hexameters* into *Latin Pentameter Verse*; but the most complete Edition of this Author is given us by Dr. *Edward Wells*, who has not only illustrated this Author by Maps of ancient Geography, but modernized them by Notes, explaining the several Countries he treats of, according to their present State.

This poetical Geographer is usually read in *Westminster*, and other eminent Grammar-Schools, as a *Greek Classic*, of whom *Turnebus* says; “ If this Poem was well digested, it would make a Man as thoroughly acquainted with the ancient Geography of the whole Earth, as he is with the Town in which he was born and bred.”

It is observable, that he speaks of the *Insulæ Hesperidæ*, or *Western Islands*, with respect to the large Quantities of Tin found there, which, he says, were possessed by the illustrious *Iberians*. He speaks of two *British Islands*, and asserts, that they are the largest of all the Islands of the known World. It is plain, in ancient Times, the Inhabitants of the Western Part of this Island were included under the Name of *Iberians*; and by the two great *British Islands*, situated opposite to the Mouth of the *Rhine*, he must undoubtedly mean *Great-Britain* and *Ireland*. This Author is said to have wrote some other Books concerning the Nature of Stones, &c. which are now lost.

Authors are silent as to his Profession, and the Time of his Death.

A P O L L O N I U S.

*A*POLLONIUS, of *Perga*, a City in *Pamphilia*, was a famous Geometrician in the Reign of *Ptolomy Euergetes*, which reaches from the 133d Olympiad, to the 3d Year of the 139th. He studied a long Time in *Alexandria*, under the Disciples of *Euclid*, and composed several Books, of which only his Books of *Conic Sections* are still extant.

It appears from the Author's Epistle Dedicatory to *Eudemus*, a Geometrician in *Pergamus*, that this Work consisted of eight Books; and that the Public have not yet seen the last of these eight.

Some Authors attribute to him the Comment on the *Phænomena* of *Aratus*. It is much esteemed, and several ancient and modern Authors have taken the Pains to comment upon, or translate it; though Mr. *Des Cartes* had no favourable Opinion of it. After many other Translations and Comments upon it, *Martin Gibertaldus* endeavoured to correct it, according to the Sense of the Author, and to resolve the Problems; and by this Means restored Life to this antient Geometrician.

Claude Richard, Professor of Mathematics in the Imperial College of his Order at *Madrid*, in the Year 1632, explained, in his public Lectures, the first four Books of *Apollonius*, which were reprinted at *Antwerp* in 1655, in Folio; and the great Duke *Ferdinand II.* and his Brother, Prince *Leopold de Medicis*, employed a Professor of the Oriental Languages at *Rome* to translate the 5th, 6th, and 7th Books of *Apollonius* into *Latin*, printed at *Florence* in 1661; with the Commentary of *Borelli*, who maintains these Books to be the ingenious Productions of our *Apollonius*, by many unquestionable Authorities.

Some have thought, that *Apollonius* appropriated the Writings and Discoveries of *Archimedes*, *Heraclius* affirms it; but *Eutocius* endeavours to confute him; and, upon the whole, he is allowed the Honour of explaining a difficult Subject better; and has made several Improvements both in *Archimedes's* Problems and in *Euclid*: And it seems a groundless Supposition, that

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Archimedes was the first who wrote of *Conics*, notwithstanding his Treatise of *Conics* was greatly esteemed.

Apollonius had a Son of the same Name, who was the Messenger that presented the second Book of the *Conic Sections* to the Person to whom it was dedicated, who paid him the Compliment of the great *Geometrician*; but his Contemporaries spake with this Restriction, that his Treatise of *Conics* was formed on the best Rules of any that had at that Time appeared of his particular Profession. As to the Time of his Death Authors are silent.

ARISTARCHUS.

ARISTARCHUS, a Greek Philosopher, and Native of *Samos*, was one of the first, who maintained, that the Earth turned upon its Center, and described annually a Circle round the Sun. *Sextus Empericus* confirms this Opinion. *Plutarch*, intending to clear up a Thought of *Plato*, and considering with himself whether that Philosopher did not believe the Motion of the World, adds, that this Opinion was afterwards that of *Aristarchus*. And *Archimedes* intimates this more plainly. These are his Words: *Aristarchus*, the *Samian*, confuting the Notions of Astrologers, laid down certain Positions, from whence it follows, that the World is much larger than generally imagined; for he lays it down, that the fixed Stars and the Sun are immoveable; and that the Earth is carried round the Sun in the Circumference of a Circle. According to some Historians, *Cleanthus* was of Opinion, that *Greece* ought to have tried *Aristarchus* for Irreligion, for endeavouring to preserve the regular Appearance of the heavenly Bodies, by supposing that the Heavens themselves stood still; but that the Earth revolved in an oblique Circle, and at the same Time round its own Axis. He invented a peculiar Kind of Sun-Dials, mentioned by *Vitruvius*. There is extant of his Works only a Treatise of the Magnitude and Distance of the Sun and Moon, translated into *Latin*, and commented on by *Frederic Commandin*, and published with the

74 BIOGRAPHIA PHILOSOPHICA.

Explication of *Pappus*, in 1572. Dr. *Wallis* published it in *Greek*, with the *Latin* Version of *Commandin*, in 1688, and inserted it in the third Tome of his Mathematical Works. The System of the World, which appeared under his Name, is controverted, and said to be *Robertvals*. The Time when *Aristarchus* flourished is not certainly known; but that he was born in the Life-time of *Archimedes* is not disputed. Some say, that he was a Cotemporary with him. *Blancanus* mentions, that he flourished about the 89th Olympiad, but probably it was later. *Vitruvius*, naming some Mathematicians who were Inventors, places *Aristarchus* in the first Rank.

A R C H I M E D E S.

IN the early Dawn of the *Roman* Glory abroad, when *Marcellus* was Consul at *Rome*, and *Hiero* King of *Syracuse*, in *Sicily*; there flourished in this latter City a Person, named ARCHIMEDES, whose Mathematical Genius set him with such distinguished Excellence in the View of the World, as made him not only the Honour of his own Age, but the Admiration of Posterity: He was an Instance, of late Years, well confirmed, to what a Height of Knowledge the human Mind is capable of attaining, when attentive only to one Species of Science.

His MECHANICS are at large discoursed of in *Polybius*, *Livy*, and *Plutarch*; particularly concerning some Engines, invented by him to defeat the Approaches of the Enemy, when his paternal City was besieged by the *Romans*.

It is not to be disputed, but that he invented the Properties and Proportions of the Cylinder and Sphere, and some other Mathematical Figures; as one Sort of *Spiral*, which to this Day goes by his Name. He was the first that made a Sphere of Glass, through which were seen the heavenly Bodies in Motion; but upon what System they moved does not appear. We have not any direct Authority in respect to this Invention; but Tradition has delivered the Facts down to us with strong Circumstances, leading to a Confirmation of the Truth; as that these

these eminent Monuments of his Invention were graved on his Tomb, at a Time, when the Truth was well known. TULLY, in his *Tusculan Questions*, tells us, that the Tomb was wholly unknown in his Time, being over-grown with Bushes; but when he was *Questor* there, he found it out; and caused the Place to be cleared. And the Poet *Claudian* has an Epigram on this Invention :

Jupiter in parvo cum cerneret æthera vitro,
 Risit, et ad superos talia dicta dedit;
 Hæcine mortalis progressa potentia cura?
 Jam meus in fragili luditur orbe labor.
Jura poli, utrumque fidem, legesque deorum,
 Ecce *Syracusius* transtulit arte senex.
Inclusus variis famulatur spiritus astris,
 Et vivum certis motibus urget opus.
Percurrit proprium mentitus signifer annum,
 Et simulata novo *Cynthia* mense redit,
Jamque suum volvens audax industria mundum
 Gaudet, et humana sidera mente regit.
Quid falso insontem tonitru *Salmonæa* miror
 Æmula natura parva reperta manus.

ENGLISHED.

When in a glass's narrow space confin'd,
Jove saw the fabric of th' almighty mind,
He smil'd, and said: Can mortal art alone
Our heavenly labours mimic with their own?
The Syracusians brittle world contains
Th' eternal law, which through all Nature reigns.
Fram'd by his art see stars unnumber'd burn,
And in their courses rolling orbs return.
His suns through various signs describe the year,
And every month his mimic moons appear.
Our rivals laws his little planets bind,
And rule their motions with a human mind.
Salmonæus could our thunder imitate,
But Archimedes can a World create.

The same Stories are reported of him, as have since been told of Sir ISAAC NEWTON, which Two bear, in Character, a very near Resemblance; for he was frequently lost in a Kind of *Reverie*, so as to appear hardly sensible: And *Plutarch* tells us, that he used to be carried to the Baths by Force. It seems, however, that the Bath awakened him; as it was there he discovered what other Metals might be included in, or mixed with Gold. The Book wherein this Discovery is illustrated is lost, and we have only what follows from VITRUVIUS.

HIERO, King of *Syracuse*, intending to make an Offering to the Gods of a golden Crown, contracted with an Artificer to make one of a great Price, and gave him the Gold, which the Workman finished, and delivered full Weight. It was afterwards discovered, that Part of the Gold was stolen, and its Place supplied with Silver. HIERO, displeased at the Imposition, desired *Archimedes* to consider how it might be known, what Quantity of different Metals might be contained in the same Vessel. While engaged in the Solution of this Difficulty, he happened to go into the Bath; where observing, that a Quantity of Water over-flowed in Proportion to the Body that was in it, it immediately occurred to him, that *Hiero's* Question might be solved by a like Method. Accordingly, he made two Masses of equal Weight with the Crown; one of Gold, and one of Silver. Then filled a Vessel to the Brim with Water, and put the silver Mass into it; upon which a Quantity of Water over-flowed equal to the Mass; then taking the Mass out, he filled up the Vessel again, measuring the Water exactly that he put in; this shewed him what Measure of Water answered to the Mass of Silver. Then he tried the Gold in like Manner, and found less Water to overflow, as the Bulk of the Gold, tho' of equal Weight, was much less than the Silver. Then he filled up the Vessel a third Time, and put therein the Crown of Gold, when he found more Water to over-flow than in the golden Mass of the same Weight, whence by the Difference he computed, what Silver was mixed with the Gold, and thus exposed the Fraud.

Many of his Works are lost. Those come to our Knowledge are, — two Books of the *Sphere* and *Cylinder*. — The Dimension of a Circle. — Of *Aquiponderants*, or Centres of Gravity. — Of *Spheroids* and *Conoids*. — Of *Spiral Lines*. — The

Qua-

Quadrature of a Parabola — of the *Number of the Sand* — and of *Bodies that float on Fluids*. He is said to have invented an Engine, called the *Cochlea*, § by which he drained all *Egypt*, and would empty the Water from any Depth; that he launched *Hiero's* great Ship, and set the *Roman* Vessels on Fire with Burning-glasses. These seem great Matters to some Writers; but as a Vessel is easily burnt, that comes within the Focus of a Burning-glass; so is a Ship of any Magnitude easily launched being constructed on a declining Slip, as all must be, or must be out of the Power of any Mechanism to effect.

We do not find any Description of this launching Engine, nor any authentic Account of the Magnitude of the Ship, tho' attempted by many Authors, very little to the Satisfaction of a curious Enquirer. As to the Burning-glass, if the Relation is to be depended upon, it is only to be thus considered; that what is there called Ships, were generally but small Vessels, and might by the Situation of the Place be obliged to go near the Shore, and on the South-side of the Station, where a very large Glass, with a proper Focus, might be set, and in such a Case be fired by the converging Rays: But as this requires many Circumstances to make it feasible, I believe that none but those unacquainted with the Nature and Reason of this Subject will give much credit to the Story. * It is no
X Dishonour

§ This Machine is still called *Archimedes's* SCREW, and is in general Use.

* As there is no Probability in the Nature of Things of the above-mentioned extraordinary Effects of Burning-glasses, whether *Speculums* or *Lenses*, used singly by themselves, tho' in the Hands of so skilful a Person as *Archimedes*, much more absurd must it be to pretend, that they had the Knowledge of any compound Burning-glass; especially such a one as consists of Pieces of plain Looking-glass, put together in the Manner of that invented lately by *Monsieur Buffon*. For this supposes, that they had not only the Art of making large Concave Speculums; but also, that they understood the Art of making and foliating Looking-glasses; nothing of which appears from History, or is worth the Belief of any judicious Person. If any Thing of this Kind had been extant, the great *Roger Bacon* would undoubtedly have hence been fond of the Subject, and related the wonderful Effects of these Burning-glasses, among other Things of the like Nature, on which he has a particular Chapter, *viz.* Concerning the Inventions and wonderful Machines of the Antients, in his Book *De Naturalitate Magiæ*: Upon the whole, *Richard Waller*, Esq; has a particular
Essay

Dis honour to ARCHIMEDES critically to examine Relations concerning him, as it is the Fate of human Affairs, to be extravagant in our Characters, and to give them to the World with great Addition or Diminution ; and in this Light are most Historians to be read. In respect to this great Man, we are apt to imagine, that we have various Accounts concerning him that are not true, and unhappily deficient in many that are, and that might be of eminent Service to Mankind.

After all his Efforts to save *Syracusa*, when besieged, it was at length taken by Storm, and *Archimedes* was so very intent upon a Demonstration of Geometry, that he neither heard the Noise, nor minded any Thing else, until a Soldier that found him tracing of Lines, and drawing Circles, asked him his Name, and upon his Request to be gone, and not disorder his Figure, slew him. *Marcellus*, who had given strict Orders to use him civilly, was much concerned for his Death, and received his surviving Friends very kindly for his Sake. He was slain in the 542d of *Rome*, in the first Year of the 142d Olympiad, and in the 212th Year before Christ.

HIPPARCHUS.

Hipparchus, a great Philosopher, Son of *Pisistratus*, a Native of *Nicaea*, in *Bythinia*, flourished between the 154th and the 163d Olympiad. We have the strongest Argument that can be for it ; since it is drawn from the Astronomical Observations which he made in that Interval of Time. *Ptolomy*, King of *Egypt* has related some of them. *Vossius*, *Calvisius*, and *Suidas*, differed somewhat about the Time ; but *Moreri* has placed *Hipparchus* in the Year 570 of *Rome*, under the Reign of *Ptolomy* ; we are not, however, over-sollicitous to determine this

Essay on this Subject (published among the Philosophical Experiments and Observations of Dr. *Hook*) in which, after having examined all the Passages of antient Authors relative to this Subject, he concludes in these Words.—“ I am of Opinion, that the Antients were wholly ignorant of refracting Burning-glasses, except Spheres ; and therefore, that it is no strange Thing, that they had neither Telescopes nor Microscopes ; both which noble Inventions have discovered new Worlds to the last and present Age.”

this Point. We have still some of his Works extant, viz. his Commentary upon the Phænomena of *Aratus*, which is properly a Criticism; for he notes his Errors, and even accuses him of having stole from *Eudoxus's* Writings. The first Publisher of *Hipparchus's* Commentary was *Peter Victorius*: *Petavius* has given us a more correct Edition of it, to which he has added a Latin Translation; his other Works were *de Constitutione Stellarum inerrantium, et Statione Immotâ, deque mensura Lunæ Motu secundum Latitudinem, &c.* *Pliny* makes frequent and honourable Mention of *Hipparchus*: he places him in the Number of those sublime Geniuses, who by the Prediction of the Eclipses shewed, that Men ought not to be surprized at this Phænomenon. *Thales* was the first among the *Greeks*, who could foretel the Time of Eclipses. *Sulpitius Gallus*, among the *Romans*, began to be successful in that Sort of Prediction; and he made a very seasonable Trial thereof the Night before the Battle in which *Perseus* was overcome. *Hipparchus*, after these two, extended his Science much farther; for he made an *Ephemerides* for six Hundred Years to come, being thoroughly acquainted with the different Computations of the Months, Days, and Hours, Situations of Places, and the different Aspects in the several Nations; in such a Manner, that *Pliny*, and others, called him on this Account the *Confident of Nature*: The Eulogies he bestows upon the Astronomers upon that Occasion seem to be very well grounded, which may be thus read.—Illustrious Men, nay more than Men, who first discovered the Laws by which those great Divinities are governed, and first set free the Minds of Men, who used to tremble at Eclipses, fearing that they should occasion terrible Calamities, or the Extinction of those glorious Luminaries. Hail! ye Interpreters of Heaven, learned in the Nature of all Things, and Discoverers of a Subject, whereby you have overcome both Gods and Men; for what Mortal, seeing these Things, and the stated Labours of the Stars, will not be content with the Necessity to which his own Nature is subjected. *Hipparchus* did so carefully observe what concerns Eclipses, that he found out the Proportions of their Intervals. He observed, that the Eclipses of the Moon might return at five Months End, and the Eclipses of the Sun at seven,
and

and that the Sun might be eclipsed twice in the Space of 30 Days, with respect to the different Parts of the Earth.

Hipparchus also asserted, that the Gods are subject to a Law. *Pliny* owns there is a Propriety in saying, that God loves Order, and Good, by a necessary and indispensable Law; for, on the contrary, it would be an Imperfection to violate that Law. But it is doubtless an Imperfection to be subject to an Order, which retards or weakens our Functions; and therefore they, who pretended the Stars were Gods, were obliged to say, if they argued consistently, that the Astronomers had discovered the Weakness of the Divine Nature, and its Dependence on a very burthensome Law, which subjected it to a Sort of Annihilation, Fainting, or Slavery. To this it may be objected, that the Sun is no less luminous in itself at the Time of an Eclipse than before, or after; but may I not answer, that a Courier, who is stopped, loses nothing of his Vigour and Health; it is nevertheless a Proof of his Submission to a Law; it is, in a Word, a Sign of Weakness, to see that he cannot continue his Journey. Apply this to the Sun, and you will find, that his Eclipses are a Sign of Imperfection. They hinder him from enlightening the Earth; he is a Prince whose Couriers are stopped, and whose Functions are interrupted. If *Pliny* had reasoned well, he had not drawn the Consequence, which he has from that Phænomenon: He would not have said, that this ought to comfort Men on Account of their Mortality; he would rather have said, the Stars were not of a divine, independent Nature, but the Offspring of God.

Hipparchus is greatly admired for having taken a Review of the Stars, and is even said to be the first who counted them, and described their Situation, and Magnitudes, who put his Posterity in a Capacity of discovering, not only whether they appear or disappear, but also whether they change their Place, and increase or decrease.

We learn from a Passage of *Pliny*, that *Hipparchus* ascribed to our Souls a Celestial Original. In the *Latin* it is very beautiful, and to this Purpose. *This same Hipparchus can never be sufficiently praised; for No-body more clearly proved, that Men are allied to the Stars, and that our Souls are a Part of Heaven, divine, &c.* He mentioned a new Star, which was produced in his

his Days ; and by its Motion, at its first Appearance, he began to doubt whether this did not frequently happen, and whether those Stars, which we call fixed, do not likewise move. He endeavoured also to reduce to Rule the many Discoveries he made, and invented new Instruments, whereby he marked their Places in the Heavens, and their Magnitudes ; so that by Means of them it might be easily observed, not only whether they appear and disappear, but likewise whether they pass by one another, or move, and whether they increase or decrease. He recommended the Knowledge of the Heavens as worthy the Study of Mankind, and what would recompence the greatest Labour of any who should be able to fathom those Mysteries. *Strabo* accuses this Astronomer of being too critical, and of having made Use of a Manner of criticising which favoured more of *Chicane* than Accuracy ; but *Pliny* appears to have judged more justly of him : And indeed it deserves Mention to his Honour, that however he might see it expedient to conform to some popular Customs relating to Pagan Idolatry, his Sentiments of God were far more sublime than consisted with it, and might, if properly reasoned upon, have afforded great Light to Posterity on so important a Subject.

History also celebrates him for the Love of his Country ; and from his Zeal therein, he is said to have delivered their Country from Tyranny : Therefore Statues were also erected to his Memory ; but History is silent as to the Time of his Death.

Z E N O.

ZENO was a Native of *Citium*, in the Isle of *Cyprus*. His great Application to Study and Love of Philosophy rendered him famous in History. He was the Head of the Sect of the *Stoics*. Before he entered on any Profession, some Historians say, he consulted the *Oracle*, from whom he is said to have received a very ambiguous Answer, *viz.* that in order to be happy, he must become of the Colour of the Dead. This, however, he construed that he was to apply himself to Study ; and other Historians mention a different Cause. They mention his Application

to the Study of Philosophy, and say, that he was possessed of a considerable Estate, or Effects; and in his Return from *Phenicia* he was ship-wrecked in the Port of *Pyrhea*, and to support his Mind under the Loss, he read the Writings of *Xenophon*, which gave him so much Delight, that he soon forgot his Loss; and having asked his Bookseller where those Sort of Men lived of whom *Xenophon* spoke, the Bookseller seeing *Crates*, the *Cynic*, going by accidentally, said to *Zeno*, behold the Man! follow him. *Zeno*, who was then thirty Years of Age, followed *Crates*, and became his Disciple: And his Ingenuity and Penetration led him early to distinguish the Nature and Difference both of Opinions and Actions. His modest and reserved Temper prevented him from falling into some Imprudencies for which the *Cynics* were blameable.

Zeno continued his Studies for ten Years under *Crates*. At Length, having acquired a Knowledge of the superior Improvements of *Stilpo*, a Philosopher of *Megara*, he resolved to place himself under his Tuition. When going, *Crates* held him by his Garment, and would have engaged him to continue with him; but *Zeno* told *Crates*, there was no retaining a Philosopher but by his Ears: Convince me, said he, that your Doctrine is preferable to *Stilpo's*; for otherwise, though my Body be with you, my Soul will be with him.

Zeno studied ten Years more under *Stilpo*, *Zenocrates*, and *Polemon*: After which he retired, and instituted a new Sect of his own; and having obtained great Credit from writing a Treatise concerning the *Common-Wealth*, a great Number of Disciples adhered to him, and he became the Head of the Sect denominated *Stoics*.

The *Stoics* were distinguished by that Name from *Zeno's* using to preach, or read Lectures on Philosophy in a Gallery, called by the *Greeks Stoa*, which was sometimes used as a Place to consult or dispute about Opinions.

The *Stoics* held, that there was only one Supreme Being; that all Things happened by a fatal Necessity, which they defined to be such a fixed Order, and Concatination of Causes, as were unalterable by God himself. Hence the Names given to this Deity was sometimes *Fate*, sometimes *Spirit*, and at other Times *Jupiter*; that this Being was an Animal, immortal,

rea-

reasonable, perfect, happy, and free from all Evil ; that his Providence governed the World, and all the Beings that were therein.

They admitted of two Principles which were the *Agent* and the *Patient* ; that is to say, *God* and the *World*.

They were of Opinion, that Matter was divisible to Infinity ; that there was but one World, and that the World was of a round Figure, which is the properest for Motion. They believed, as well as *Pythagoras* and *Plato*, that it was animated by a spiritual Substance, which was disposed throughout all its Parts ; that this Substance was not distinguished from God, and that it formed with the World one and the same Animal ; whereof, according to Some, the principal Part was the Heavens ; and according to Others, the Sun : That the World was placed in the Center of an infinite, void Space ; and that none of the Parts of the World admitted of a *Vacuum* ; because the fluid Matter which agrees with all Sorts of Figures, filled up the Spaces that were left by the gross Bodies, which could not immediately join every where, because of their Irregularity.

The *Stoics* also held, that the World was subject to Corruption ; because every Part that constituted the System of the World was constantly tending to Decay ; and that there was nothing created could be exempt from it ; that the fixed Stars were borne away by the Motion of the Heavens ; that the Sun was a Fire, whose Body was larger than that of the Earth, since the Earth cast a Shadow in the Form of a Cone ; and that the Sun and the other Planets subsisted by the Vapours which were exhaled from the Earth and the Sea. They had a some Knowledge of the Causes of Eclipses of the Sun and Moon, and of Thunder and Lightening. They said, that the two frigid Zones were uninhabitable, by reason of the extraordinary Cold ; and that the torrid Zone was likewise uninhabitable, because of the excessive Heat. These were some of the discriminating but crude Sentiments of the *Stoics* with respect to philosophical Science ; but there was also a Variety of Opinions which prevailed amongst Others, who divided into lesser Sectaries.

Aristo, the *Stoic*, declared himself an Enemy to Logic, comparing subtle Arguments usually to Cobwebs, which really
 7 shewed

shewed something very ingenious, and well contrived, but were intirely uselefs.

Chrysippus on the contrary, had a great Esteem for Logic; and so far excelled in that Art, that every one agreed, had the Gods stood in need of Logic, they would have chosen no other than that of *Chrysippus*.

But to return: King *Antigonus* admired *Zeno* the Philosopher so much, that, whenever he came to *Athens*, he always was present at his Lectures, and used often to go and eat at *Zeno's* House, or invite him to *Aristotle's*. But *Zeno* afterwards avoided going to public Assemblies, for fear he should become too familiar with Pleasure.

Antigonus used his utmost Endeavours to engage him to live with him; but *Zeno* excusing himself, sent *Perseus* and *Philonides* with this solid and obliging Letter.

“ GREAT SIRE,

“ I am extremely pleased to find *Antigonus* express so great an
 “ Inclination for the Sciences; since nothing would sooner
 “ divert him from sensual Pleasures, and incline him to Virtue
 “ than the Love of Philosophy. Did not my Age and Infir-
 “ mities prevent me, I would not fail to attend you as you de-
 “ fire; but as I cannot possibly do it, I send you two of my
 “ Friends, who are no Ways inferior to me either in Sense or
 “ Doctrine, and are of a much stronger Constitution; if you
 “ will converse seriously with them, and apply yourself to the
 “ Performance of those Precepts they will lay before you, you
 “ will see then that Nothing will be wanting to compleat your
 “ Knowledge and Happiness.”

But as some Diamonds have their Specks, and the greatest Men their Foibles, so this truly wise Man had his Errors.

He held, among other unjustifiable Notions, that every Man might lawfully deprive himself of Life, when, and in what Manner he pleased; which he confirmed by making his own untimely Exit. After a small Accident, in coming out of his School, he hit his Hand against something, and broke one of his Fingers, which he took for a Warning from the Gods. And

striking his Hand against the Ground, he said, Dost thou require me? I am ready; and immediately strangled himself, in the 98th Year of his Age, without ever being subject to any Infir- mity, and in the 129th Olympiad. He was greatly regretted by *Antigonus*, who desired the *Athenians* to bury him with Marks of distinguished Honour. This was executed pursuant to a De- cree made as follows :

“ Whereas, *Zeno*, the Son of *Mnasea*, of *Citium*, hath
 “ spent many Years in teaching Philosophy in this City, and
 “ on all Occasions hath behaved himself like a good Man,
 “ continually recommending Virtue to the Youth under his
 “ Care, and hath always lived conformable to the Precepts
 “ that he taught; therefore, it is thought reasonable to cele-
 “ brate his Praise in a public Manner, to present him with a
 “ Crown of Gold, and to erect a Monument for him, at the
 “ public Expence,* in the *Ceramic* Suburbs. The People re-
 “ quire that five Men in *Athens* be chosen to have the Direc-
 “ tion of making the Crown, and the Monument; and that the
 “ Scribe of the Republic shall engrave this Decree upon two
 “ Columns, one whereof shall be placed in the Academy, and
 “ the other in the *Lycæum*; and that the Money, necessary for
 “ finishing this Work, be immediately deposited in the Hands
 “ of the Persons who are intrusted with the Care of this pub-
 “ lic Affair; to the End that all the World may know, that
 “ the *Athenians* are mindful of bestowing Honours on Men of
 “ a distinguished Merit, both during their Lives, and after their
 “ Death.”

T H E O D O S I U S.

THEODOSIUS, a Native of *Tripoli*, flourished in the Times of *Cicero* and *Pompey*. He cultivated that Part of Geometry which relates to the Doctrine of the Sphere, con-
Zcern-

* This Decree was made whilst *Archenidas* was *Archon*, chief Ma- gistrate of the City of *Athens*.

cerning which he published three Books; the first of which contains 22 Propositions; the second 23, and the third 14. They were all published in *Greek*, with a *Latin* Version at *Paris*, by *John Pena*, Regius Professor of Astronomy. *Ptolomy* borrowed many Things from *Theodosius*; as also from *Pappus*, *Proclus*, *Theon*, and many others; but without mentioning his Name. *Vitellio*, likewise, acquired great Reputation by translating *Theodosius* into *Latin*; and so highly was this *Greek* Author esteemed by the *Arabians*, that they likewise translated his Book of the Sphere into their own Language. From the *Arabic* his Works were again translated into *Latin*, and printed at *Venice*; but the *Arabic* Version being exceedingly defective, occasioned the above-mentioned Translation and Edition by *Pena*, printed at *Paris* in the Year 1558. This Author's Works were afterwards commented upon and illustrated by *Clavius*, and *Heleganius*, *Guarinus*, and lastly by *C. Millet de Shales*, in his *Cursus Mathematicus*. *Theodosius*, the *Tripolite*, is mentioned by *Suidas*, and is, undoubtedly, the same with *Theodosius* the Philosopher of *Bythinia*, whom *Strabo* asserts to have excelled in the mathematical Sciences, as also his Sons; for the same Person might have travelled from *Bythinia* to *Tripoli* in *Africa*, and there have lived the Remainder of his Life, in the same Manner, as *Hipparchus* was called by *Strabo* the *Bythinian*; but by *Ptolomy*, and others, the *Rhodian*.

Theodosius wrote concerning Habitations; as also, concerning *Days* and *Nights*; which Copies, in *Greek*, are to be found in the King's Library at *Paris*. Of these there was likewise a *Latin* Edition, published by *Peter Dasypody*, in the Year 1572; but that Edition of *Theodosius's Spherics*, which is now most in Use, was translated, and published, by the learned *Dr. Barrow*, in the Year 1675, illustrated and demonstrated in a new and concise Method. By the same Author's Account, *Theodosius* appears, not only to be a great Master in this more difficult Part of Geometry, but is the first considerable Author of Antiquity that has wrote on the Subject. We find nothing relating to the Time and Manner of his Death.

L U C R E T I U S.

L U C R E T I U S, commonly called *Titus Lucretius*, was born, according to *Eusebius*, in the 2d Year of the 171st Olympiad. As he discovered a very great Readiness of Wit and a Disposition to Learning, he was sent by his Relations to Study at *Athens*, under *Zeno*, an *Epicurean* Philosopher, and his Improvements were so great, that he was justly esteemed, as well by *Cicero*, as others, the sublimest of all the Poets : And *Cicero* says, he would venture to affirm, that none of the *Roman* Writers deserve to take Place of *Lucretius* in Point of Purity of Language. He also discovered a considerable Genius in the philosophical Sciences, of which his Writings are a Demonstration. He composed six Books, entituled *de Rerum Naturâ*, wherein he learnedly explains *Epicurus's* *Physicks*. The same Author informs us, that *Cicero* corrected his Works ; but notwithstanding the Excellency of his Parts, and his Reasoning well on some Subjects, he entertained the grossest Errors with respect to God, his Providence, and the Nature of the human Soul ; which, probably, might be partly owing to some false Principles imbibed in his Education. Concerning God, &c. we may gather his Sentiments from the following Lines :

*That whatsoe'er's Divine must live in Peace,
In undisturb'd, and everlasting Ease :
Not care for us ; from Fears and Dangers free,
Sufficient to its own Felicity :
Nought here below, nought in our Pow'r it needs,
Nor smiles at Good, nor frowns at vicious Deeds.*

He held also the Doctrine of *Atoms*, and a *Vacuum* ; and that the Souls of Men were mortal ; notwithstanding which, he was celebrated for his Honesty, and esteemed for his sundry moral Virtues. Many Eulogies on this Writer are to be seen in Mr. *Creech's* *English* Edition of this Work, with an excellent Paraphrase and Notes.

T A R R E N T I U S.

TARRANTIUS.

LUCIUS TARRANTIUS, surnamed *Firmanus*, because he was a Native of *Firmum*, a Town in *Italy*, flourished at the same Time with *Cicero*, and was one of his Friends and Contemporaries. He was a mathematical Philosopher, and was therefore thought to have great Skill in judicial Astrology. He has been rendered most famous by his drawing two *Horoscopes*; * (which signifies the Degree of the Ascendant, or Star rising above the Horizon) one was the *Horoscope* of *Romulus*, and the other of *Rome*. *Plutarch* gives the following Account of it. “*Varro*, who was the most learned of the *Romans* in History, “had a particular Friend named *Tarrantius*, who, out of Curiosity, applied himself to draw *Horoscopes*, by Means of astronomical Tables, and was esteemed the most eminent in his Time.” Historians controvert some particular Circumstances of his Calculations; but all agree in conferring on him the honorary Title of *Prince of Astrologers*.

M. TULLIUS CICERO.

MARCUS TULLIUS CICERO is remarkable in History, as an Orator, a Politician, Historian, and Philosopher. Our Business leads us chiefly to consider him as the Latter, in which, tho’ he did not make any considerable Discoveries, he recommended what had been the Entertainment and Improvement of his Youth. He spent great Part of his Time under the Tuition of the most skilful Philosophers at *Athens*, where he studied under *Atticus*, the Philosopher; and pursued the Study of Oratory under the Care of *Demetrius*. He flourished in the Reign of *Julius Cæsar*. Being advanced to about 31 Years of Age, he arrived at that full Perfection which had so long

* Viz. Casting the Nativity of *Romulus*; and erecting a Scheme of the Heavens, from whence to predict the Fate of *Rome*, according to the Jargon of those *Tarrantine* Professors.

long taken up his whole Wishes and Endeavours ; and which has been ever since the Admiration, or Envy of the World. That *Cicero* is the first of all Authors for Matter, Method, and Stile, is denied by no Man of any Experience : None appears to have been more blessed with a clear Penetration into the Nature, Relation, and Properties of Things, and an undisguised Simplicity and Frankness in declaring his Sentiments. Philosophy, particularly of the Moral Kind, received great Improvements from him. His *Tusculan Questions* are universally admired, and are said to excel all that was ever written by any heathen Writer before him. In the Origin, Progress, and Perfection of Eloquence, he far excelled the *Greeks*, whom he at first very carefully studied ; and after that, used his best Endeavours to extend the Bounds of the *Roman Learning*, as wisely esteeming that Attempt superior to his extending the Bounds of their Empire. When he recommended Oratory, he always guarded his Pupils against a mere Jargon of Words, tho' ever so elegant and select, if they carried no Weight of Sense and Learning along with them. And for this Reason, *Quintilian* says, “ That Person may be sure to make great Improvement in the learned Sciences, who has a true Relish for the Writings of *Cicero*.” This was that *Cicero* who was first dignified with the Title of *The Father of his Country*, by *Quintus Catulus*, the Head of the Senate : Nay, he was so called by *Cato*, who was never suspected of Flattery. *Lucius Gellius* also says, “ That he had deserved a Crown.” We shall therefore finish our Account of him with the Eulogium given him in *Toland's Character*, &c. “ How great is the Dignity, Efficacy, and Sweetness of his Eloquence ! How exuberant the Source of his Invention ! How just his Topics for Amplification ! How exquisite and beautiful his Method ! What Perspicuity, what stupendous Elegance, and what beautiful Figures adorn the Whole ! What an uninterrupted Course of Argument ! What an irresistible Strength of Perswasion, and yet how easy ! How simple ! How pleasant ! How genteel ! And how greatly does this Eulogium come short of his Deserts, whom all his Cotemporaries admired, whose Death all his Country regretted, and whose Memory all their Posterity honoured !”

S O S I G E N E S.

SOSIGENES was an *Ægyptian* Mathematician, whose principal Studies were Chronology and the Mathematics. He made great Improvements, and gave some Proofs of his being able to demonstrate the Certainty of his Discoveries; by which Means he became popular, and obtained Repute with those who had a Genius to understand and relish such Enquiries. He was thence sent for by *Julius Cæsar*, who being convinced of his Capacity, employed him in reforming the Calendar; and it was he who formed the *Julian* Year, which begins 45 Years before the Birth of Christ. This remains to perpetuate his Memory to this Time. His other Works are lost since that Period.

He was well versed in the Mathematics and Astronomy of the Ancients; particularly of those celebrated Mathematicians, *Thales*, *Archimedes*, *Hipparchus*, *Callipus*, and many others, who had undertaken to determine the Quantity of the Solar Year; which they had ascertained much nearer the Truth than one can well imagine they should with Instruments so very imperfect; concerning which we refer the Reader to *Ptolomy's Almagest*. — We have no Account of the Time, or Manner of his Death.

M A N I L I U S.

MANILIUS, sometimes called *Marcus Manilius*, the Astronomer and Poet, descended from a noble Family at *Rome*, and lived in the Age of *Augustus*, had a liberal Education suitable to his Quality, and the Time in which he lived. His Writings shew him to be well-acquainted with the Principles of the several Sects of Philosophers, but addicted to the *Stoics*, whose Hypotheses, in all their Out-lines, bear a very near Resemblance. The *Stoics* assert, “ That there is One infinite, eternal, almighty Mind, which, being diffused thro’ the whole Universe of well-ordered and regularly disposed Matter, actuates every Part of it,

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and is, as it were, the Soul of this vast Body: The Parts of this Body, they say, are of two Sorts, the Celestial, *viz.* the Planets and fixt Stars, and the Terrestrial, *viz.* the Earth, and all the other Elements about it. That the Celestial continue the same without any Change or Variation; but that the whole sublunary World is not only subject to a Dissolution, but shall be reduced to *Chaos* by *Fire*; and that out of That, another System should arise; that God governs the World by enduing the several Parts of Nature with certain Powers sufficient to produce the designed Effects; this they call *Fate*; and upon this Principle their System of Astrology depends."

This is the Hypothesis which *Manilius* endeavours to explain in *Latin Verse*: Had he lived to revise it, we have Reason to think that it would have been finished with masterly Improvements. He had a Genius equal to his Undertaking; his Fancy was bold and daring; his Skill in the Mathematics great enough for his Design; his Knowledge of the History, and Acquaintance with the Learning of the Antients, general: Some of the Critics place him amongst the judicious and elegant; and all allow him to be One of the useful, instructive, profitable Poets. He hints at the same Opinions which later Ages have thought fit to glory in as their own Discoveries. Thus he defends the Fluidity of the Heavens against the Hypothesis of *Aristotle*.

He asserts particularly, "that the fixed Stars are not all in the same concave Superficies of the Heavens, and equally distant from the Centre of the World. He maintains, that they are all of the same Nature and Substance with the Sun, and that each of them has a particular Vortex of his own; and lastly, he affirms, that the milky Way is only the undistinguished Lustre of a great many small Stars, which the Moderns now see to be such, thro' the Help of Glasses adapted to this Purpose."*

And speaking of the Constellations, he says,

*All these still keep one Course, and all pursue
Their constant Track, nor vary in a New.
From one fix'd Point they start, their Course maintain,
Repeat their Whirl, and visit it again;*

And

* This he has ingeniously expressed in the Lines quoted in the *Gentleman and Lady's Philosophy*, page 145.

*And this is strange, and this doth more surprize
Than all the other Wonders of the Skies,
That such unweildy Frames their Signs should draw,
As mov'd by Reason, and confin'd by Law;
No Change in Distance nor in Site appear,
Tho' great the Number, long the rolling Year.*

It appears from some of his Writings, that he wrote his *Astronomical Poems* in his younger Years, which is also corroborated by Others, who have quoted him; and that he died before he arrived to a middle Age. He frequently discovered a great Desire to live to be old. It is highly probable, that Desire might arise from his eager Thirst after Knowledge: It is probable too, that he was sensible of the Weakness of the human Capacity to pry into the secret Springs and Effect of Nature, and that he might suspect his own Sentiments, and wish for the latest Period of Life in hopes of arriving at the highest Pitch of human Knowledge. Notwithstanding this Supposition, it is certain, he had attained to a great Proficiency in the Astronomical Science, and was, in the Language of an Historian, a most discerning Philosopher, as well as an Adept in Poetry. According to the best Judges in *Latin Poetry*, his *Astronomical Poem* was always esteemed a very great Performance; and if we may believe his Translator, Mr. Creech, his Poem was as correct as VIRGIL'S *Georgics*; and that he had a Design, when he wrote it, to rival the inimitable Elegance of that Poet. At least, he values himself greatly, on his Subject being new, and far different from those of the Poets before him; for, in the *Preface* to his *Second Book*, after recounting the various Topics of other Poets, he has these Lines:

*I seek new Springs, which rowl refreshing Waves
Thro' Plains untrod, and purl in hidden Caves,
Kept pure for Me, which Birds did ne'er profane,
And thirsty Phœbus oft bath sought in vain:
My Verse shall be my own, not stol'n but wrought;
Mine, not the Labours of another's Thought.
My Vessel trimm'd, tho' never launch'd before,
I spread my Sails, and boldly leave the Shore.*

And the same aspiring Spirit evidently appears in the *first Lines* of his *third Book*.

*Whilst I new Ways attempt my grow'ling Name
To raise from Earth, and wing my Flight for Fame;
Thro' Woods untrodden whilst I take my Way,
Ye Muses, lead; for I extend your Sway
To larger Bounds, and make the World obey.*

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These Flights of his Imagination, this Fondness to excel and gain Applause, corresponds with the Grandeur of his Birth, Education, and Esteem at Court, and is a farther Proof that he wrote very young; his Poem is too fierce and fiery for an advanced Age; and he sometimes wants Transition, when he is obliged to give Rules. Though he struggles against these Fetters, and strives to reach the strongest Metaphors; yet from his Descriptions a Man may read his Youth in his Writings. However, notwithstanding his Works may have their Imperfections, yet they plainly indicate a strong Genius, capable of great Improvements. It is no mighty Wonder, that he was not included in *Ovid's* List of celebrated Poets, since nothing of his Works were published till after *Ovid's* Decease; and it is highly probable, that from this Circumstance, his Works have been less taken Notice of than otherwise they would have been. As it appears, that he was born at *Rome*, and resided much at that Court, we may reasonably conclude with Historians in general, that he died there, though the Time and Manner of his Death is not ascertained.

VIRGIL.

PUBLIUS VIRGILIUS MARO was born on the fifteenth Day of *October*, in the Year of *Rome* 684, in the Consulship of *Pompey* and *Crassus*, at a Village called *Andes*, now *Petuta*, not far from *Mantua* in *Italy*. His Father's Name was *Virgil*, according to the Opinions of *Servius* and *Probus*; for if he had been called *Maro*, as *Donatus* affirms, our Poet's Name must

have been, according to the Custom of the *Romans*, *Publius Maro Virgilius*.

Though his Father was undoubtedly of low Birth, and mean Circumstances ; yet, by his Industry, he so much recommended himself to his Master, that he gave him his Daughter, named *Maia*, in Marriage, as a Reward of his Fidelity. *Virgil*, discovering very early Marks of a very fine Genius, was sent, at 12 Years of Age, to study at *Cremona*, where he continued till his seventeenth Year. He then removed to *Milan*, and from thence to *Naples*, being the Residence of several Teachers of Philosophy and polite Learning, where he prosecuted his Studies with great Industry and Intensity, carefully perusing the most elegant of the *Greek* and *Roman* Writers ; but *Physic*, the *Mathematics*, and natural Philosophy, were his favourite Sciences, and to which he principally attached himself ; and to this early Tincture of geometrical Learning were owing that Regularity of Thought, that Propriety of Expression, and that Exactness of conducting all Subjects, for which he is so remarkable. He learned the *Epicurean* Philosophy under the celebrated *Syro*, of whom *Cicero* speaks twice, with the greatest Encomiums, both of his Learning and Virtue. His Acquaintance with *Varus*, his first Patron, commenced by his Fellow-student with him under this Philosopher, for whom *Virgil* seems to have had a prodigious Affection and Esteem. The small Patrimony that *Virgil* had in *Italy*, was lost by a Decree of *Augustus*, who divided that Part of this Country among his Soldiers ; and our young Poet, being involved in the common Calamity, applies himself to *Varus*, who recommended him to *Pollio*, then Governor of the Province, whose Favour introduced him into the Court of *Augustus*. From this Prince and Protector of Learning he obtained a Grant, by which his Lands were exempt from the general Division, and restored to him. Another Incident that procured him Favour with *Augustus* was, that the Emperor having a Colt presented him by the *Crotoniates*, which promised prodigious Swiftnefs and Spirit, *Virgil* immediately pronounced, that he came from a sickly Mare, and would be good for Nothing, which proved the Case.

We cannot imagine, that such an exalted Genius as *Virgil* was blessed with would lie long unactive and unexerted. We
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are told accordingly, that in the Warmth of early Youth, he formed a noble Design, and boldly intended to write a Poem on the Wars of *Rome*; but after some Attempt, he was discouraged by the Roughness and Asperity of the *Roman* Names, or for the Reason assigned by our *English Boileau*, that it was an Undertaking above his Years. Captivated with the Beauties of *Theocritus's Idylliums*, and ambitious of introducing a new Species of Poetry among the *Romans*, our Poet from hence-forward seems to have bent his whole Thoughts on the Imitation and Rivalship of that sweet *Sicilian*: To this End, he first applied himself to the Writing of Pastorals.

Of these Compositions, it is highly probable, that his *Alexis* was his first Performance. Dr. *Martyn* thinks it might have been written in the Year of *Rome* 709, when the Poet was in his twenty-fifth Year, which was but a short Time before the Death of *Julius Cæsar*. Probably the *Palæmon* was his second Performance.

We may here mention the *Silenus*, as the next Composition in the Order of Time. This fine Piece of Philosophy is said to have been publicly recited on the Stage.

Virgil composed his celebrated Eclogue, in the Year of *Rome* 714, intended chiefly to celebrate the Honour of *Pollio* to whom he dedicated it, not only as his Patron, but as the Friend of his Country, as the Guardian of Liberty, a Promoter of Arts and Sciences, and an accomplished Courtier. Conscious of the Dignity of the Person he was writing to, he has exerted his Genius and warmed his Fancy, and has given us some of the most spirited and sublime Images that are to be found in his Works.

Pollio was the first who erected a public Library at *Rome*, adorned with curious Busto's of the most celebrated Writers, as well as furnished it for the Purposes of Learning. It was none of the smallest Honours *Virgil* met with to be protected and esteemed by this accomplished Senator.

In another of his Eclogues, he introduces his Friend *Cornelius Gallus*, which highly pleased *Augustus*.

About this Time, he was much in the Esteem of *Augustus*, who enabled him to enjoy his Studies, and to retire to a delightful and convenient Privacy at *Naples*, for the Sake of his Health, as the Air of *Rome* was not agreeable to his Constitution.

He now enters on the 34th Year of his Age, and lays the Plan of his inimitable *Georgics*; Corn and Ploughing are the Subjects of the First; Vines of the Second; Cattle of the Third; and Bees of the last Book. This he undertook at the Entreaties of that wise and able Minister *Mecænas*, not to rival and excel *Hesiod*, as he had lately done *Theocritus*; but to promote the Welfare of his Country. Great was the Desolation occasioned by the Civil Wars. *Italy* was almost depopulated, the Lands uncultivated, and untouched; and to revive the decayed Spirit of Husbandry, and to introduce a general Taste for Agriculture, was a Task worthy a *Mecænas* to propose, worthy an *Augustus* to promote, worthy a Philosopher, and a Poet, such as *Virgil* was to execute. And what Method so likely to effect it, as to recommend Agriculture, with all the insinuating Charms of Poetry. And this Design the *Georgics* fully answer; wherein are all the masterly Beauties that might be expected from an exalted Genius, whose Judgment and Imagination were in full Vigour and Maturity; and who had Leisure to give the last Polish and Perfection to his incomparable Workmanship. *Virgil* seems to be the most perfect in his Style. There's a Profusion of the most daring Metaphors, and most glowing Figures; there's such a Majesty and Magnificence of Diction throughout the *Georgics*, that notwithstanding the marvellous Harmony and Grandeur of the *Greek* Versification, is scarcely equalled by *Homer* himself.

Virgil's Terms and Epithets are chosen with such Propriety, Elegance and Expressiveness, that, as Mr. *Addison* truly observes, we receive more strong and lively Impressions from his Words, than we could have done from the Objects themselves, and find our Imaginations more affected by his Descriptions, than they would have been by the very Sight of what he describes. *Virgil*, doubtless, merits Praise for giving Life and Feeling, Love and Hatred, Hope and Fear, Wonder and Ambition to Plants, and to Trees, and to the very Earth itself; and for exalting his favourite Insects (the Bees) by endowing them with Reason, Passion, Arts, and Civil Government. To use *Aristotle's* Expression, *Every Thing in this Poem hath Manners*, and all the Creation is animated. According to Historians, he spent seven Years in compiling his *Georgics*. In the progressive Task, he passed the

the most exact Scrutinity on his Works, having wrote a few Lines in the Morning, he used to revise them in the remaining Part of the Day.

We are now advanced to that Period of his Life, when he enters on his *Æneid*, in the 45th Year of his Age; the main and principal Purport of which was, to represent the Glory of the *Augustine* Age, and pay his Tribute of Homage to his Royal Prince. Minutely to describe the Parts, point out the Connection, and describe the Beauties of this matchless Poem, would be no less tedious, than beside our Purpose.*

His Person was somewhat tall. He was of a swarthy Complexion, of a sickly Constitution, and often afflicted with the Head-ach. He was temperate in his Diet, and very regular, sober, and chaste in his Morals. Tho' he was so bashful, that he frequently went into Shops to avoid being gazed at in the Streets of *Rome*; yet so honoured was he by the *Romans*, that coming once into the Theatre of *Rome*, the whole Company rose up out of Respect to him. He was of a thoughtful and melancholy Disposition, spoke little, lov'd Retirement and Contemplation, and was an Enemy to those talkative Impertinents, from whom no Court (not even that of *Augustus*) could be free. His Fortune was not only easy, but affluent; he had a delightful *Villa* in *Sicily*. His Behaviour was so benevolent and inoffensive, that even his cotemporary Poets agreed in paying the utmost Respect to him.

Augustus, returning from the East with Victory, met with *Virgil* at *Athens*, who thought himself obliged to wait on the Emperor back to *Italy*; but he was suddenly seized with a fatal Distemper, which being increased by the Agitation of the Vessel, he had scarce Time to land at *Brundisium*, where he died on the 22d Day of *September*, in the 52d Year of his Age. What can give any Reader an higher Opinion of his Modesty and Genius than his earnestly requesting, on his Death-bed, that his *Æneid* might be burnt, because it had not received his last Corrections and Improvements? His Remains were carried to *Naples* according to his Request; and a Monument was erected to his Memory, at a small Distance from the City.

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* See his Life, prefixed to *Pitt's* Edition of his Works.

We shall conclude by only observing, that he went out of the World with all that Calmness and Serenity of Mind with which the antient Writer of his Life says he came into it; making the Inscription of the Monument himself. He ended his poetical Compositions with an Epitaph; and this he made exactly according to the Law of his Master *Plato* on such Occasions, without the least Ostentation.

*I sung Flocks, Tillage, Heroes; Mantua gave
Me Life, Brundisium Death, Naples a Grave.*

O V I D.

PUBLIUS OVIDIUS NASO, a *Roman* Knight, and one of the most celebrated Poets, Orators, and Philosophers of the *Augustine* Age, was born at *Salmo*, a Town in the Country of the *Peligni*, about 90 Miles from *Rome*, in *March*, 43 Years before the Christian *Æra*, and in the Year of *Rome* 710. He descended from an ancient Family of great Honour and of the Equestrian Order, and had the Advantage of a liberal Education.

His Father designed him for the Bar, but Nature inspired him with so strong a Disposition to Poetry, that his Love to the Muses diverted him from that Application necessary to arrive at Dignity in that Profession.

He studied Eloquence and Oratory under *Aurelius Fuscus* and *Porcius Latro*, under whose Instruction he acquired a good Proficiency therein. He said, of himself, he pleaded in Causes at the *Centumviri*; but his Inclination to Poetry was still predominant, and upon the Death of his elder Brother, he became possessed of an ample Fortune, and then followed his Genius and Studies.

His fine Parts for Poetry were soon distinguished by the *Roman* Wits and ingratiated him into the Favour of *Tibullus*, *Severus*, *Sabinus*, *Græcinus*, and *Flaccus*, Men of Note and Learning, and

and from whose Acquaintance he had the Opportunity of informing his Mind, and improving his Genius.

His Talent and Disposition for Philosophical Enquiries appear very conspicuous in many Parts of his Works; and had he used more Application to this Study, his Parts would, doubtless, have shined in this Science with peculiar Lustre. We shall attempt to give some Instances of the vast Extent of his Imagination, interspersed throughout his Works; and transcribe some Lines here and there, worthy our Notice on this Subject.

Thus he imitates, and in other Words conveys *Job's* elegant Sentiment of God's hanging the Earth upon nothing.

*Nec circumfuso pendebat in aere tellus
Ponderibus librata suis.*

Here it is obvious (says Sir *Samuel Garth*,) that *Ovid* had a discerning Notion of the Gravitation of Bodies. 'Tis now demonstrated, says he, that every Part of Matter tends to every Part of Matter with a Force, which is always in a direct, simple Proportion of the Quantity of the Matter, and an inverse duplicate Proportion of the Distance; which Tendency or Gravitating is constant, and universal. This Power, whatever it be, acting always proportionably to the solid Content of Bodies, and never in any Proportion to their Superficies, cannot be explained by any material Impulse; for the Laws of Impulse are physically necessary. There can be no arbitrary Principle in meer Matter; its Parts cannot move, unless they be moved, and cannot do otherwise, when pressed on by other Parts in Motion; and therefore, 'tis evident, from the following Lines that *Ovid* had strictly adhered to the Opinion of the most discerning Philosophers, who taught, that all Things were formed by a wise and intelligent Mind.

*Jussit & extendi campos subsidere valles
Fronde tegi Sylvas——*

The *Fiat* of the Hebrew Law-giver is not more sublime, than the *Jussit* of the Latin Poet, who goes on in the same elevated and philosophical Style.

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*His super imposuit liquidum & Gravitate carentem
Æthera* —————

Here the Author spreads a thin Veil of Æther over his infant Creation ; and tho' his asserting the upper Region to be void of Gravitation may not be mathematically true ; yet it is found from the natural Enquiries made since, especially by the learned *Sir Isaac Newton*, in his *Principia*, that the Planetary System consists of so fine an Æther as to give no Resistance to Bodies in Motion, or none that is sensible for many Ages, since the Planets and Comets still move with the same Velocity as they were found to do in the earliest Ages of Astronomy.

Some Critics have insinuated that he mistook the annual Motion of the Sun for the diurnal, from the following Passage

Seetus in obliquum —————, &c.

Tho' the Sun be always in one or other of the Signs of the Zodiac, and never goes by either Motion more Northward or Southward than is here described ; yet *Phaeton* being designed to drive the Chariot but one Day, ought to have been directed into the Equator, or a Circle parallel to it, and not round the other oblique one of the Ecliptic ; a Degree of which, and that by a Motion contrary to the Diurnal, he was obliged to go in that Length of Time.

Thus it appears, says our Author, that *Ovid* had some Knowledge of Astronomy ; but it is highly probable, that he had so great an Attention to poetical Embellishments, that he voluntarily declined a strict Observance of any astronomical System. For tho' that Science was far from being neglected in former Ages, yet the Progress which was made in it by no Means equalled that of our present Time.

However, it has been generally allowed, that *Ovid's Metamorphoses* contain all the principal Parts of moral and natural Philosophy known in those Times, in a poetical Disguise, and as to that of the *Pythagoreans*, in particular, which is not only the most antient, but the most just System of Nature, we cannot pass by his august Description both of that Philosophy, and its Author, in the following Lines.

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*Here dwelt the Man, divine, whom Samos bore,
But now, self-banish'd from his native Shore,
Because he hated Tyrants ; nor could bear
The Chains, which none but servile Souls will wear.
He, tho' from Heav'n remote, to Heav'n could move,
With Strength of Mind, and tread th' Abyss above ;
And penetrate, with his interior Light,
Those upper Depths, which Nature hid from Sight :
And what he had observ'd and learnt from thence,
Lov'd in familiar Language to dispence.*

*The Crowd with silent Admiration stand,
And heard him, as they heard their Gods' Command ;
While he discours'd of Heav'n's mysterious Laws,
The World's Original, and Nature's Cause.
And what was God, and why the fleecy Snows
In Silence fell, and rattling Winds arose :
What shook the steadfast Earth, and whence begun
The Dance of Planets round the radiant Sun ;
If Thunder was the Voice of angry Jove,
Or Clouds, with Nitre pregnant, burst above.
Of these, and Things beyond the common Reach,
He spoke, and charm'd his Audience with his Speech.*

In Poetry, according to Sir Samuel Garth, he excelled many in the Propriety of his Similies and Epithets, in the Perspicuity of his Allegories, the instructive Excellence of his Morals, and the peculiar happy Turn of his Fancy. His Works can only suggest to what a Pitch of Perfection he was capable of attaining, had he used more Application in his Youth, and been less unfortunate in his middle Age.* His natural Ease of Temper, Wit, and Good-humour, engaged him too much in Company, especially with the Fair Sex, to leave him Time to be exact in his Compositions.

He was very amorous in his Youth, and indulging the fashionable Vice of the Age, he had several Mistresses. We should much rather cast a Veil over his mistaken Notions of Happiness and irrational Pursuit of sensual Pleasure ; and tho'

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* Garth's Preface to Ovid.

we cannot intirely pass it by, it may suffice, in Brief, to mention the unhappy Consequences attending them.

Notwithstanding the Favour and high Esteem he was in, and the Honours conferred upon him by *Augustus*, thro' his over Gaity of Temper, he made and uttered some Verses so justly censured by *Augustus*, that he was expelled the Court; and he also committed some other Acts for which he was banished (by *Augustus*) to *Gataë*; and tho' he was never so happy as to be recalled from Banishment, he seemed to acquiesce in the Justice of his Sentence, and spent the latter Part of his Life, in some Measure, consistent with his State of Adversity, and behaved himself in such an engaging Manner, that he met with Humanity and Tenderneſs even from the Barbarians. He desired, if he died in the Country of the *Gataë*, his Ashes might be carried to *Rome*. The Epitaph he composed for his Tomb was, in *English* thus,

Here lies Love's faithful Slave beneath this Stone,

Ovid, the Poet, by his Wit undone.

Let ev'ry Lover as he passes by,

Wish that his Bones may unmolested lie.

He died in his Exile, in the 4th Year of the Emperor *Tiberius*, in the Year of *Rome* 771, in the 60th Year of his Age; and the People of *Gataë* raised a Tomb to his Memory, and paid many superstitious Honours thereto.

AURELIUS CORNELIUS CELSUS.

THIS Person is celebrated in Antiquity for his Skill in *Physic* and *Surgery*; but more particularly for the excellent Writings which he has left us on those Subjects. They are contained in eight Books; the first six of which treat of the various Disorders incident to human Bodies in their several Parts, for which he has prescribed the proper Medicines to remove them. The two last Books are taken up on the Topic of *Surgery*; wherein

wherein he gives a Description of the several Bones of the human Body, and of the various Accidents to which they were frequently exposed, with the various Processes of *Surgery* used in those Times. He has been looked upon, in the Capacity of a *Physician* and *Surgeon*, to have excelled any *Roman* Author that ever wrote; and even in Judgment and Character, equal to *Hippocrates* himself. Indeed, he has been several Times stiled the *Roman Hippocrates*. However, this is well known, that in his Writings, he consulted that Author principally, and quotes a great Number of Passages from his Writings in general; but one Half of his *Aphorisms* are translated *verbatim* in his Works; as may be seen at the End of the *Dutch* Edition of this Author; where near 40 Pages are employed by *Henricus Stephanus* in collecting the same. It would be endless to collect all the *Encomiums* given him in different modern Authors of the highest Reputation; some of whom have been so bold as to style him *Medicorum Deus, The God of the Physicians*: Others say, that he contributed more to the Glory of *Rome*, than either *Galen* or *Hippocrates* did to *Greece*. We shall sum up the Whole in the Words of *Hieronymus ab Aquapendente*, who says, *Celsus is wonderful in every Thing; I consult him continually both by Day and Night*. It is not certain whether he was a *Roman*, by Birth, or by obtaining his Freedom of the *City*; but he lived and wrote at *Rome*; and tho' the Time be not precisely certain, yet it is well known, that it was in, or near the Time of *Augustus*; and consequently in the Age of the purest *Roman* Eloquence: And this is another Thing that makes this Author so valuable, for his Language hath, by many Critics in *Latin*, been thought little inferior to the purest *Roman* Classic Writers. For this take *Quintilian's* Testimony, who says, "That *Celsus* was a learned Man among those *Latin* Philosophers who have been celebrated for their Eloquence." He wrote many Things in a most accurate and polished Stile. He has been stiled the purest Writer of the *Roman* Tongue, and has been compared to *Cicero* himself, and reckoned the Father of the Elegance and Eloquence of the *Roman* Language. There is little known of his Parentage or Family; but that he was a considerable Person is evident from his having been honoured with a triple Denomination, the *Nomen*, *Prænomen*, and *Cognomen*; for to People of inferior Rank

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or Station in Life, no more than Two of these were allowed; and this also appears from several Medals that were struck of him. It is not certain how long he lived, or when he died. He was the Author of many other Writings, which have not reached our Times; particularly, several Epistles of his, and some Writings upon military Subjects; some on Rhetoric, and others upon Husbandry, which are comprized in the following Epigram of *J. Doufa*.

*Faëta urbana tuo res rustica munere, scriptis;
Nec minus illustris est medicina tuis.
Hinc quoque Militiae tractâsti commoda, Rhetor,
Hoc martem Musis jungere, Celse, fuit.*

P L I N Y.

PLINY the Elder was born at *Verona*, a Town in *Italy*, in the State of *Venice*, and flourished in the Reign of *Vespasian* and *Titus*. According to History, his admirable natural Capacity, improved by the Knowledge of Science, enabled him to act in various Capacities, and sustain a Diversity of Characters with Dignity and Applause; as a Politician, an Orator at the Bar, a Commander in the Field, an Historian, and what crowns all, a Philosopher. He wrote the History of *Nero*, the Life of *Pompey* the II^d, and the Wars of *Germany*; but these are buried in the Ruins of Time. And the only Writings of his extant, and which afford us no small Proof of his distinguishing Abilities, are his natural History of the World in 36 Books, wherein he hath discoursed with great Penetration of the Nature of God; of the Sun, Moon and Stars; of the Planets in general; of the various Laws of Nature; of the Figure and Boundary of our System; of the various Productions of Nature; in short, of every Thing from the starry Heaven to the Center of our Earth.

That he applied himself to study with indefatigable Diligence, appears, not only from the Number of his Works, but from
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discernable from what Mountain this Cloud issued; but it was found afterwards to ascend from Mount *Vesuvius*. I cannot give you a more exact Description of its Figure, than by resembling it to that of a Pine-Tree; for it shot up a great Height, in the Form of a Trunk, which extended itself at the Top into a Sort of Branches; occasioned, I imagine, either by a sudden Gust of Air that impelled it, the Force of which decreased as it advanced upwards, or the Cloud itself, being pressed back again by its own Weight, expanded in this Manner: It appeared sometimes bright, and sometimes dark and spotted, as it was either more or less impregnated with Earth and Cinders. This extraordinary Phænomenon excited my Uncle's philosophical Curiosity to take a nearer View of it.

“ He ordered a light Vessel to be got ready, and gave me the Liberty, if I thought proper, to attend him. I rather chose to continue my Studies; for, as it happened, he had given me an Employment of that Kind. As he was coming out of the House, he received a Note from *Rectina*, the Wife of *Bassus*, who was in the utmost Alarm at the imminent Danger which threatened her; for her Villa being situated at the Foot of Mount *Vesuvius*, there was no Way to escape but by Sea; she earnestly entreated him therefore to come to her Assistance. He accordingly changed his first Design, and what he began with a philosophical, he pursued with an heroical Turn of Mind. He ordered the Gallies to put to Sea, and went himself on board with an Intention of assisting, not only *Rectina*, but several others; for the Villas stand extremely thick upon that beautiful Coast. When, hastening to the Place from whence others fled with the utmost Terror, he steered his direct Course to the Point of Danger; and with so much Calmness and Presence of Mind, as to be able to make and dictate his Observations upon the Motion and Figure of that dreadful Scene. He was now so nigh the Mountain, that the Cinders, which grew thicker and hotter the nearer he approached, fell into the Ships, together with Pumice-stones, and black Pieces of burning Rock: They were likewise in Danger not only of being a-ground by the sudden Retreat of the Sea, but also from the vast Fragments which rolled down from the Mountain, and obstructed all the Shore,

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“ Here he stopped to consider whether he should return back again: to which the Pilot advising him, *Fortune*, said he, *be- friends the Brave; carry me to Pomponianus*. *Pomponianus* was then at *Stabiæ*, separated by a Gulph, which the Sea, after several insensible Windings, forms upon that Shore. He had already sent his Baggage on board; for tho’ he was not at that Time in actual Danger; yet being within the View of it, and, indeed, extremely near, if it should in the least increase, he was determined to put to Sea as soon as the Wind should change. It was favourable, however, for carrying my Uncle to *Pomponianus*, whom he found in the greatest Consternation: He embraced him with Tenderness, encouraging and exhorting him to keep up his Spirits; and the more to dissipate his Fears, he ordered, with an Air of Unconcern, the Baths to be got ready; when after having bathed, he sat down to Supper with great Chearfulness, or at least (what is equally heroic) with all the Appearance of it.

“ In the mean while, the Eruption from Mount *Vesuvius* flamed out in several Places with much Violence, which the Darknes of the Night contributed to render still more visible and dreadful. But my Uncle, in order to sooth the Apprehensions of his Friend, assured him it was only the Burning of the Villages, which the Country People had abandoned to the Flames: After this, he retired to Rest, and it is most certain, that he was so little discomposed as to fall into a deep Sleep; for being pretty fat, and breathing hard, those who attended without actually heard him snore. The Court which led to his Apartment being now almost filled with Stones and Ashes, if he had continued there any Time longer, it would have been impossible for him to have made his Way out; it was thought proper therefore to awaken him. He got up, and went to *Pomponianus*, and the Rest of his Company, who were not unconcerned enough to think of going to Bed. They consulted together whether it would be more prudent to trust to the Houses, which now shook from Side to Side with frequent and violent Concussions; or fly to the open Fields, where the calcined Stones and Cinders, tho’ light indeed, yet fell in large Showers, and threatned Destruction. In this Distress they resolved for the Fields, as the less dangerous Situation of the two: A Resolution, which, while the Rest of the

the Company were hurried into by their Fears, my Uncle embraced upon cool and deliberate Consideration.

“ They went out then, having Pillows tied upon their Heads with Napkins; and this was their whole Defence against the Storm of Stones that fell round them. Tho’ it was now Day every where else, with them it was darker than the most obscure Night, excepting only what Light proceeded from the Fire and Flames. They thought proper to go down farther upon the Shore, to observe if they might safely put out to Sea, but they found the Waves still run extremely high and boisterous. There my Uncle having drank a Draught or two of cold Water, threw himself down upon a Cloth which was spread for him; when immediately the Flames and a strong Smell of Sulphur, which was the Forerunner of them, dispersed the Rest of the Company, and obliged him to arise. He raised himself up with the Assistance of two of his Servants, and instantly fell down dead; suffocated, as I conjecture, by some gross and noxious Vapour, having always had weak Lungs, and being frequently subject to a Difficulty of Breathing. As soon as it was light again, which was not ’till the Third Day after this melancholy Accident, his Body was found intire, and without any Marks of Violence upon it, exactly in the same Posture that he fell, and looking more like a Man asleep than dead.”

“ The Letter which, in Compliance with your Request, I wrote to you concerning the Death of my Uncle, has raised, it seems, your Curiosity to know what Terrors and Dangers attended me while I continued at *Misenum*; for there, I think, the Account in my Former broke off:

Tho’ my shock’d Soul recoils, my Tongue shall tell.

Æneid II. by Mr. PITT.

“ My Uncle having left us, I pursued the Studies which prevented my going with him, ’till it was Time to bathe. After which I went to Supper, and from thence to Bed; where my Sleep was greatly broken and disturbed. There had been for many Days before some Shocks of an Earthquake, which the less surprized us, as they are extremely frequent in *Campania*; but

but they were so particularly violent that Night, that they not only shook every Thing about us; but seemed, indeed, to threaten total Destruction. My Mother flew to my Chamber, where she found me rising, in order to awaken her. We went out into a small Court belonging to the House, which separated the Sea from the Buildings.

“ Tho’ it was now Morning, the Light was exceedingly faint and languid; the Buildings all around us tottered; and tho’ we stood upon open Ground, yet, as the Place was narrow and confined, there was no remaining there without certain and great Danger: we therefore resolved to quit the Town. The People followed us in the utmost Consternation, and (as to a Mind distracted with Terror, every Suggestion seems more prudent than its own) pressed in great Crowds about us in our Way out. Being got at a convenient Distance from the Houses, we stood still, in the Midst of a most dangerous and dreadful Scene. The Chariots which we had ordered to be drawn out, were so agitated backwards and forwards, tho’ in the open Fields, that we could not keep them steady, even by supporting them with large Stones. The Sea seemed to roll back upon itself, and to be driven from its Banks by the convulsive Motion of the Earth; it is certain, that the Shore was considerably enlarged, and several Sea-animals were left upon it. On the other Side, a black and dreadful Cloud bursting with an igneous, serpentine Vapour, darted out a long Train of Fire, resembling Flashes of Lightning, but much larger.

“ Soon afterwards the Cloud seemed to descend, and cover the whole Ocean; as indeed, it intirely hid the Island of *Caprea*, and the Promontory of *Misenum*. My Mother strongly conjured me to make my Escape at any Rate, which as I was young,* I might easily do: As for herself, she said, her Age and Corpulency rendered all Attempts of that Sort impossible; however, she should willingly meet Death, if she could have the Satisfaction of seeing that she was not the Occasion of mine. But I absolutely refused to leave her, and taking her by the Hand, I led her on: She complied with great Reluctance, and not without many Reproaches to herself for retarding my Flight. The Ashes now began to fall upon us, tho’ in no great Quantity.

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* But eighteen Years of Age.

tity. I turned my Head, and observed behind us a thick Smoke, which came rolling after us like a Torrent. I proposed, while we had yet any Light, to turn out of the high Road, lest we should be pressed to Death in the Dark, by the Crowd that followed.

“ We had scarce stepped out of the Path, when a Darkness over-spread us, not like that of a cloudy Night, or when there is no Moon, but of a Room when it is shut up, and all the Lights extinct. Nothing then was to be heard but the Shrieks of Women, the Screams of Children, and the Cries of Men; some calling for their Children; others for their Parents; others for their Husbands; and only distinguishing each other by their Voices; one lamenting his own Fate, another that of his Family; some wishing to die, from the very Fear of dying; some lifting up their Hands to the Gods; but the greater Part imagining that the last and eternal Night was come, which was to destroy both the Gods and the World together. Among these, there were some who augmented the real Terrors by imaginary ones; and made the frightened Multitude falsely believe that *Misenum* was actually in Flames. At length, a glimmering Light appeared, which we imagined to be rather the Fore-runner of an approaching Burst of Flames, (as in Truth it was) than the Return of Day: However, the Fire fell at a Distance from us: then again we were immersed in thick Darkness, and a heavy Shower of Ashes rained upon us; which we were obliged every now and then to shake off; for otherwise we should have been crushed and buried in the Heap. I might boast, that during all this Scene of Horror, not a Sigh, or Expression of Fear escaped from me, had not my Support been founded in that miserable, tho’ strong Consolation, that all Mankind were involved in the same Calamity, and that I imagined I was perishing with the World itself.

“ At last, this dreadful Darkness was dissipated by Degrees, like a Cloud, or Smoke; the real Day returned, and even the Sun appeared, tho’ very faintly, and as when an Eclipse is coming on. Every Object that presented itself to our Eyes (which were extremely weakened) seemed changed, being covered over with white Ashes, as with a deep Snow. We returned to *Misenum*, where we refreshed ourselves as well as we could,

could, and passed an anxious Night between Hope and Fear; tho' indeed, with a much larger Share of the latter: For the Earthquake still continued, while several enthusiastic People ran up and down heightening their own and their Friends Calamities by terrible Predictions. However, my Mother and I, notwithstanding the Danger we had passed, and that which still threatened us, had no Thoughts of leaving the Place, 'till we should receive some Account of my Uncle."

CLAUDIUS PTOLEMÆUS.

CLAUDIUS *Ptolemæus*, commonly called *Ptolemy*, a celebrated Philosopher and Mathematician, was born at *Pelusium*, and taught Astronomy at *Alexandria* in *Ægypt*. He flourished in the Time of the Emperor *Antoninus*. He is said to be of royal Extraction. He has always been reckoned the Prince of Astronomers among the Antients, and in his Works has left us an entire Body of that Science. His Book, called *Almagestum Magnum*, or, *The great Construction of mathematical Astronomy*, will perpetuate his Name to latest Posterity. Notwithstanding the Principles of his System are erroneous, yet his Works will be always useful to the Studious in this Science. This Work was originally wrote in *Greek*, and has been translated into *Latin* by several Hands; the last of which was by *Trapezuntius*, and was published by his Son at *Basil*, with a Dedication to Pope *Sixtus*.

This Work is founded upon the Hypothesis of the Earth's being at Rest, and that the heavenly Bodies, the Stars and Planets, all move about it in solid Orbs, whose Motions are all directed by one, which he called the *Primum Mobile*, or, *First Mover*; of which he discourses at large.

This great Work is divided into 13 Books; in the First, he shews, that the Earth is in the Center of those Orbs, and of the Universe itself, as he understood it: He always represented the Earth to be a spherical Figure, and that it is but a Point in Comparison of the Rest of the heavenly Bodies. He likewise dis-

discourses concerning the several Circles of the Earth, and their Distances from the *Equator*; as also, of right and oblique Ascension of the heavenly Bodies in a right Sphere.

In the 2d Book, he treats of the habitable Parts of the Earth; of the Elevation of the Pole in an oblique Sphere, and the various Angles which the several Circles make with the Horizon, according to the different Latitude of Places; also of the *Phænomena* of heavenly Bodies depending thereon.

In the 3d Book, he treats of the Magnitude of the Year, and of the unequal Motion of the Sun thro' the Zodiac. In the same Book, he gives the Method of computing the mean Motion of the Sun, and has calculated Tables thereof, and likewise treats of the Inequality of Days and Nights.

In the 4th Book, he treats of Lunar Motions, and their various *Phænomena*: He gives Tables for finding the mean Motions of the Moon; as also, of her Latitude and Longitude. In this Book, likewise, he discourses largely concerning Lunar *Epicycles*; and by comparing the Times of a great Number of Eclipses, mentioned by *Hipparchus*, *Calippus*, and others, he has computed the Places of the Sun and Moon, according to their mean Motions from the first Year of *Nabonazar*, King of *Ægypt*, to his own Time.

In the 5th Book, he treats of the Construction of an Instrument, which he calls an *Astrolabium*; and he also treats of the Excentricity of the Lunar Orbit, and the Inequality of the Moon's Motion, according to its Distance from the Sun. He also gives Tables, and an universal Canon of the Inequality of the Lunar Motions; with a general Calculation relating thereto; of the different Aspects, or Phases of the Moon, and a Computation of the Distance of the Moon, of the Diameter of the Sun and Moon, and of the Magnitude of the Sun, Moon, and Earth, compared together; which the Reader will find to be very different from what they are now known to be: And he treats of the different Measures of the Distance of the Sun and Moon, according as they were determined by antient Mathematicians and Philosophers.

In the 6th Book, he treats of the Conjunctions and Oppositions of the Sun and Moon, with Tables for computing the mean Time when they happen; — Of the Boundaries of
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Solar and Lunar Eclipses, of the Tables and Methods of computing the Eclipses of the Sun and Moon; with many other Particulars relating thereto.

In the Seventh, he treats of the fixed Stars; and shews the Methods of describing them, in their various Constellations, on the Surface of an artificial Sphere or Globe. He rectifies the Places of the Stars to his own Time, and shews how different they were from what they were in the Times of *Timocharis*, *Hipparchus*, *Aristillus*, *Calippus*, and others. Then he gives us a Catalogue of the Number of Stars in each of the northern Constellations, and their Latitude and Longitude in the Ecliptic, and the Number of Stars of each Magnitude in the several Constellations.

In the 8th Book, he proceeds to give a Catalogue of the fixed Stars, and the Number in each Constellation in the southern Hemisphere; as also, of the 12 Constellations of the *Zodiac*. This Catalogue of Stars is the first that we have extant, and is the most valuable Part of his Works. After this, he treats of the *Galaxy*, or *Milky-way*, and of the Aspect of the several Planets; of the Rising and Setting of the Sun, and of the fixed Stars.

In the 9th Book, he treats of the Order of the Sun, Moon, and Planets; and of the periodical Revolution of the five Planets; after this, he gives us the Tables of the mean Motions of the five Planets, and begins with the Theory of *Mercury*, shewing its various Phænomena with respect to the Earth.

Book the 10th begins with the Theory of the Planet *Venus*, and its greatest Distance from the Sun; of its Epicycle, Excentricity, and periodical Motions; after this, he treats of the same Particulars in the Theory of the Planet *Mars*.

The 11th Book begins with the Theory of *Jupiter*, and ends with that of the Planet *Saturn*. He corrects all the planetary Motions from Observations made from the Times of *Nabonazar* to his own.

The 12th Book treats of the retrogressive Motion of the several Planets; and therein he gives Tables of their Stations, with a Table of the greatest Distances of *Mercury* and *Venus* from the Sun.

The 13th Book treats of the several Hypotheses of the Latitude of the five Planets. The Quantity of the Latitude, or Inclination of the Orbits of the five Planets, computed and disposed in Tables; the Rising and Setting of the Planets; and Tables of the Times thereof, respectively: Then follows a Conclusion of the whole Work.

We have thought proper to give this particular Account of a Work that is of the greatest Consequence to the Republic of Learning, and now become very scarce, and but little known. It will always be valuable on Account of the Observations he gives us of the Places of the Stars and Planets in former Times, according to the antient Philosophers and Astronomers that were then extant, but principally on Account of the large and curious Catalogue of the Stars, by which we can easily compare their Places in the present Age, and be thence assured of the true Quantity of their slow, progressive Motion, according to the Order of the Signs; and upon these, and many other Respects, the *Almagest* of *Ptolemy* will always be found of the utmost Service to Astronomy.

His Hypothesis of the *Immobility* of the *Earth* was shewn to be an Error by *Copernicus*, who wrote six Books (as we shall hereafter shew) to prove, the Motion of the Earth in common with the Rest of the Planets about the Sun; which Books were dedicated to Pope *Paul* the III^d, and printed in the Year 1543, which was but eight Years before the *Latin* Edition of *Ptolemy's Almagest* was printed, and dedicated to Pope *Sixtus*: This we mention only for the Sake of observing, that Two of the most famous Systems of Astronomy, and as opposite to each other as *Truth* and *Error* can be, were notwithstanding dedicated, in so short a Time, to two Popes, as Patrons of their respective Hypotheses; by which the Reader will easily judge, there is little Reason to believe any Thing concerning the Pope's Infallibility; since Pope *Sixtus* was as highly pleased with the Compliments paid him by *Ptolemy's* Translator, as Pope *Paul* had just before been with the sanguine Address of *Copernicus* for the Patronage of his System.

This Treatise of Astronomy was his great Work; besides which he wrote some others; particularly, a Volume of *Geography*, which was esteemed a Work of great Merit for several

The LIFE of DIOPHANTUS. 115

Ages after. Also, a Treatise on the *Planisphere*: Another, concerning judicial Astrology, and Prognostications, which in that dark Period made no small Part of their conjectural Learning; with an Abridgment of his large astronomical Work, in one hundred Sentences. Besides these, he wrote three Books of *Harmonics*; published, at Oxford, by J. Wallis, in the Year 1682.

We have no more to add concerning this celebrated Person, but that he died in the 78th Year of his Age, in the Year of our Lord 147, as we learn from his Commentator *Cauricus*, a Neopolitan Writer.

DIOPHANTUS.

DIOPHANTUS, of *Alexandria*, in *Ægypt*, was a famous Mathematician, and reputed the Inventor of Algebra.

As to the Age *Diophantus* lived in, we have nothing certain; all that his learned, and best Commentator, Monsieur *Bachet*, could collect concerning this Point, is as follows.

The famous Geometrician *Apollonius*, flourished in the Time of *Ptolemæus Evergetes*, King of *Ægypt*, and consequently, above 200 Years before *Christ*. *Hypsicles*, who is supposed to be the Author of the 14th and 15th Books, annexed to *Euclid's Elements*, tells us, in his Preface to those two Books, that he had seen two Copies of a Treatise of *Apollonius*, concerning the regular Bodies; whereof the former was very imperfect, but the latter came from *Apollonius* himself. Whence it plainly appears, that *Hypsicles* must have lived not long after *Apollonius*. *Diophantus*, in his Treatise of multangular Numbers, quotes *Hypsicles*; and therefore must have lived some Time after him. On the other Hand, the learned Lady *Hypatia*, who was Daughter of *Theon* the Mathematician, and lived in the Time of *Arcadius* and *Honorius*, that is, about 400 Years after *Christ*, wrote a Comment upon *Diophantus*; and therefore *Diophantus* must have lived a considerable Time before her; since it is not usual to write Comments upon modern Productions. All then that can be reason-

reasonably conjectured, from this Account, is, that *Diophantus* flourished in, or about the third Century.

His *Arithmetics* consisted of 13 Books; whereof only the first six Books are now extant. The best Edition of *Diophantus's* Works is that published at *Paris* by Monsieur *Bachet*, in the Year 1621. He has certainly best explained *Diophantus's* Meaning, and made the best Observations upon him of any Commentator before him; besides that, he has restored, and cleared up the Text in innumerable Places, which by the Ignorance, or Negligence of Transcribers, was in almost every Problem, most miserably corrupted. Besides the above-mentioned, there is another Edition of *Bachet's Diophantus*, published in the Year 1670, with *Fermat's* Observations upon some few of the Questions.

We shall here give the learned Dr. *Saunderson's* Opinion, concerning his *Arithmetics*, and his being the Inventor of *Algebra*, in his own Words, as we find them in the Doctor's Treatise of *Algebra*, p. 363.

“ *Diophantus*, of *Alexandria*, in *Ægypt*, is the first Writer of *Algebra* we meet with among the Antients: Not that the Invention of that Art is particularly to be ascribed to him; for besides that we meet with some few Sketches of it in Authors of greater Antiquity, *Diophantus* has no where, that I know of, taught the fundamental Principles and Rules of *Algebra*: He treats it every where as an Art already known, and seems to intend not so much to teach, as to cultivate and improve it, by applying it to certain indeterminate Arithmetical Problems concerning square and cube Numbers, right angled Triangles, &c. which, till that Time, seemed to be either not at all considered, or at least not regularly treated of. These Problems are very curious and entertaining; but yet in the Resolution of them there frequently occur Difficulties, which nothing less than the nicest and most refined *Algebra*, applied with the utmost Skill and Judgment, could ever surmount: And most certain it is, that, in this Way, no Man ever extended the Limits of the analytic Art further than *Diophantus* has done, or discovered greater Penetration; whether we consider his wonderful Sagacity, and peculiar Artifice in forming such proper Positions as the Nature of the Questions under Consideration required, or the more than ordinary Subtily of his Reasoning upon them. Every particu-

far Problem puts us upon a new Way of thinking, and furnishes us with a fresh Vein of analytical Treasure; which, considering the vast Variety there is of them, cannot but be very instructive to the Mind, in conducting itself through almost all Difficulties of this Kind, where-ever they occur.

The Doctor farther says, that the Way of substituting Letters for Quantities given in a Problem, as well as for those that are sought, was either not known, or not in Use in *Diophantus's* Time; nor the Way of introducing more Letters than one into a Problem, where more unknown Quantities were to be represented. And (to confess the Truth) the intolerable Liberty some modern Analysts have taken this Way, makes *Diophantus's* Method appear much the more elegant of the two: Though it must not be denied, but that it sometimes occasions Perplexity and Confusion, when the same Letter, in one and the same Problem, is made to signify two, or three different Things, as it is employed by *Diophantus* in so many different Operations.

T H E O N.

THEON, of *Alexandria*, was a celebrated Philosopher and Mathematician; he flourished in the fourth Century, about the Year 380, in the Time of *Theodocius* the Great. His Genius and Disposition for the Study of Philosophy were very early improved by close Application to Study; so that he acquired such a Proficiency in these Sciences, as to render his Name venerable in History, by his *Commentary* on the *Works* of *Ptolemy*; the Pleasure he took in the Study, and the Advantages which he apprehended might arise there-from, incited him to communicate his Thoughts thereon to others; but more particularly to imprint those noble Sentiments on the Mind of his Daughter *Hypatia*, who probably inherited her Father's Genius; for *Synisus* calls her his *Mistress in Philosophy*, as mentioned in the Writings of *Vossius*. It is likewise said, she wrote Commentaries on the *Arithmetics* of *Diophantus*.

118. BIOGRAPHIA PHILOSOPHICA.

The Study of Nature led *Theon* to many just Conceptions concerning GOD, and to many useful Reflections in the Science of *Moral Philosophy*; hence he is mentioned as having wrote with great Accuracy on the divine Providence. And he seems to have made it his standing Rule to judge the Truth of certain Principles, or Sentiments, from their natural, or necessary Tendency. Thus, he says, That a full Persuasion that the Gods see every Thing we do is the strongest Incentive to Virtue; for he insists, that the most Profligate have Power to refrain their Hands, and hold their Tongues, when they think they are observed, or over-heard by some Person, or Persons whom they fear or respect. With how much more Reason then, says he, should the Apprehension, and Belief that God sees all Things restrain Men from Sin, and constantly excite them to their Duty? He also represents this Belief, concerning the Deity, as productive of the greatest Pleasure imaginable, especially to the Virtuous, who might depend with greater Confidence on the Protection and Favour of Providence. For this Reason, he recommends nothing so much as Meditation on God's Presence; and recommended it to the Civil Magistrate, as a Restraint on such as were notoriously prophane and wicked, to have the following Inscription wrote, in large Characters, at the Corner of every Street; GOD SEES THEE, O SINNER!

He wrote a Book, entituled PROGYMNASMATA, a Rhetorical Work, wrote with great Politeness and Judgment, and criticized on the Writings of some illustrious Orators and Historians; wherein he pointed out, with great Propriety and Justness, their Beauties and Imperfections; as also, some proper Rules for Decoration and Propriety of Style. He recommends Conciseness of Expression, and Perspicuity, as the principal Ornaments; and acquits himself in most of his Disquisitions with Candour and Ingenuity.

This Book was printed at *Basil*, in the Year 1541; but the best Edition is that of *Leyden*, in 1626, in Octavo. Historians have not mentioned the Manner or Time of his *Death*, but assure us, that *Theon* was illustrious in his *Life*.

L O N G I N U S.

Longinus, or *Dionysius Cassius Longinus*, lived in the third Century, in great Reputation for his Knowledge. He was *Porphyry's* Preceptor, who highly commends him in the *Life of Plotinus*. He wrote a great many Books, of which we have only left his Book *De sublimi Dicendi Genere*.* He was likewise Preceptor of *Zinobia*, Queen of the *Palmyrians*: *Vopiscus* tells us, that the Emperor *Aurelian* caused him to be put to Death, taking him to be the Author of the Letter that Queen writ to him in *Syriac*, which appeared to him too bold and daring: This was in the Year 273. *Zosimus* speaks highly in Commendation of his Learning, his Writings, and his Courage in enduring Death. That he was a *Grecian* by Birth is plain, from his calling *Demosthenes* his Countryman. Tho' we have no particular Account of his Parents, a Remnant of his own Writing informs us, that his Youth was spent in travelling with them; which gave him an Opportunity to increase his Knowledge, and open his Mind with that generous Enlargement, which Men of Sense and Judgment will naturally receive from Variety of Objects and Diversity of Conversation. The Improvement of his Mind was always uppermost in his Thoughts, and his Thirst after Knowledge led him to those Channels by which it is conveyed. Where-ever Men of Learning were to be found, he was present, and lost no Opportunity of forming a Familiarity and Intimacy with them. *Ammonius* and *Origen*, Philosophers of no small Reputation in that Age, were two of those whom he visited, and heard with the greatest Attention. As he was not deficient in Vivacity of Parts, Quickness of Apprehension, and Strength of Understanding, the Progress of his Improvement must needs have been equal to his Industry and Diligence in seeking after it.

The Travels of *Longinus* ended with his Arrival at *Athens*, where he fixed his Residence. This City was then, and had been for some Ages, the University of the World. Here he wrote his Book of the *Sublime*.

It is this Work which intitules *Longinus* to a Place among the Philosophers in our Class; for the *Sublime*, it must be allowed,
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* The Greek Title is Περὶ τῆς De Sublimitate, concerning SUBLIMITY, in the Abstract.

is the principal Part of *Metaphysics*, and, consequently, a Part of *Natural Philosophy*; for we look upon it as the highest Part of natural Knowledge to be acquainted with the Nature, Faculties, and Powers of the Mind and Genius of a Man: And without a true Knowledge of Nature in general, no Man can pretend to understand, or make any Comparison concerning what is high or low; for the *Sublime* has relation to the greatest Things which Nature affords, as the Object of the human Understanding. To be able, therefore, to distinguish the Sublimity of an Author's Genius, presupposes, that he has a very capacious Mind, and understands, and takes in all the great Ideas that flow from the highest Subjects of Nature; for beyond the Nature of material Things we cannot pretend to aspire: And if we take a View of the Sentiments of the celebrated *Longinus* on this lofty Subject, we shall see that his Genius was equal to it.

Longinus says, that “The *Sublime* is an Image reflected from the inward Greatness of the Soul.” And if the Sentiments of this Piece be regarded as Reflections from his own Mind, the Features are so graceful, the Air so noble, and the Colouring so lively, as to shew, that those Qualifications necessary to form the Character of a Critic with Dignity and Applause centered in him.

Elevation of Thought, another great Qualification in an Orator, or Poet, is equally necessary to a Critic, and is the most shining Talent in *Longinus*.

As his Sentiments are noble and lofty, so his Style is masterly, enlivened by Variety, and flexible with Ease; there is no Beauty pointed out by him, in any other, which he does not imitate, and frequently excel.

His Judgment is exact and impartial, both in what he blames and in what he commends; every where founded upon, and supported by Reason.

His Candour is as extensive as his Judgment. The Penetration of the One obliged him to reprove what was amiss; the secret Workings of the Other bias him to excuse, or extenuate it in the best Manner he is able. Whenever he lays open the Faults of a Writer, he forgets not to mention the Qualities he had which were deserving of Praise.

The good Nature of *Longinus* ought not to be omitted. He bore an Aversion to the Sneers and Cavils of those who were unequal to the Province of Criticism, and frequently took Pains to defend the Injured, from unjust Aspersions.

The Judgment, Candour, and Impartiality with which *Longinus* declares his Sentiments of the Writings of others, will, says our Author *, rise in our Esteem, when we reflect on that exemplary Piece of Justice he has done to *Moses*. The Manner of his quoting that celebrated Passage from him, is as honourable to the Critic, as to the *Jewish* Legislator.

Longinus says, The *Jewish* Legislator, having conceived a just, Idea of the Power of God, has nobly expressed it in the Beginning of his Law; “*And God said, — What? — Let there be Light, and there was Light. Let the Earth be, and the Earth was.*”

There is also strong Probability, that *Longinus* was not only acquainted with the Writings of the *Old Testament*, but with those also of the *New*; since, to a Manuscript in the *Vatican* Library, there is prefixed a Fragment of this Author's Writings, as an Instance of his Judgement, wherein he is drawing up a List of the greatest Orators. At the Close he says, There was also one *Paul of Tarsus*, the chief Supporter of an Opinion not yet established.

Having considered *Longinus* as a Critic, we may view him likewise as a Philosopher; in him, these are not different, but mutually depending, to judge in a worthy Manner of the Performances of Men. We must know the Dignity of human Nature; the Reach of human Understanding, the Ends for which we were created, and the Means of their Attainment; in these Speculations *Longinus* made no contemptible Figure. And as the proper Knowledge of the Nature of Man leads to just, and worthy Notions of the Supreme Being; so *Longinus* censures *Homer*, for exalting his Heroes at the Expence of his Deities; Whereby he sunk the Divine Nature far below the Human. And as the Discourses of *Socrates*, and the Writings of *Plato* were his Study, it is plain, he cultivated the Knowledge and

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Reve-

* Wm. Smith, *M. A.* in his Preface to the Translation of *Dionysius Longinus*.

Reverence of the Supreme Being.—We shall conclude this Account with the following Lines of Mr. Pope.

*Thee, great Longinus! all the Nine inspire,
And fill their Critic with a Poet's Fire;
An ardent Judge, who, zealous in his Trust,
With Warmth, gives Sentence, and is always just;
Whose own Example strengthens all his Laws,
And is himself the great Sublime he draws.*

P A P P U S.

PAPPUS of Alexandria flourished at the latter End of the 4th Century, in the Time of Theodosius the Great. Tho' we meet with no particular Account of his Education, or the Philosophers under whom he studied, his Writings indicate, that he enjoyed the Advantages of strong natural Abilities, improved by Application and Industry in the Study of Philosophy; having attained to a great Proficiency therein, so as to acquire Esteem and Reputation, not only in that, but in many succeeding Ages of the World. The most considerable of these were Eight Books of Mathematical Collections, of which the two first are lost. This Work appeared in Latin at Pesanzo, in 1588, and is said also to be found in Greek in some Libraries. He wrote besides a Comment upon the *Almagest* of Ptolomy; *An Universal Chorography*; *A Description of the Rivers of Libya*; *A Treatise of Military Engines*, &c. There are also extant his Commentaries upon *Aristarchus* of Samos, concerning the Magnitude and Distance of the Sun and Moon; *Suidas*, and *Vossius de Scientiis Mathematicis*. The Propositions therein are of excellent Use, and are quoted and illustrated by many of our modern Writers. A new Edition of this Work was published by Dr. Edmund Halley, at the End of his *Apollonius*, if I remember aright, for I cannot now meet with the Book; and tho' some of his Works are buried in the Ruins of Time, those which are extant render him honourable with Philosophers, and perpetuate his Memory with Esteem to Posterity.

BOETIUS.

B O E T I U S.

BOETIUS descended from the antient Families of the *Anicii* and *Torquatii*; he lived in the 5th Century: He was educated, from his Infancy, in all Manner of Science; so that he excelled as a Statesman, and as a Philosopher. He was a Consul in 510, and was made principal Minister of State by *Theodoric*, King of the *Goths*. *Cassiodorus* commends *Boetius*, in a Letter which he wrote to him, for enriching himself at *Athens* with the Spoils of *Greece*; and for having made the Books of *Pythagoras*, the Musician of *Ptolemy* the Astronomer, of *Nicomachus* the Arithmetician, of *Euclid*, *Plato*, *Aristotle*, and *Archimedes*, well known in *Italy*, by Translations as good as the Originals. It might perhaps have been happy for him, if improving and extending the Knowledge of these Sciences had engrossed his Time and Thoughts, so as to have hindered him from having any Transactions with the State: For afterwards, the same *Theodoric*, upon a Suspicion conceived against the Senate, of some Intelligence with *Justin* the Emperor, caused *Boetius* to be arrested and conducted to *Pavia*; where, after six Months, he was beheaded, 23 Oct. 524. He composed, during this Imprisonment, Five Books of the *Consolation of Philosophy*. Several other philosophical Works are ascribed to him. *Henricus Laricus Glareanus* of *Basle* recollected all his Works, and printed them in 1546. See more of his Life in *Bayle*, *Vossius*, &c.

A L B U M A Z A R.

ALBUMAZAR is commonly included in the Chronological Table of Philosophers, tho' we meet with no Particulars of his Works, extant, only his Treatise of the Revolution of Years, *Blaneanus*, *Vossius*, &c. speak of him as a learned *Arabian*, and one of the greatest Astrologers of the Age in which he lived; which some mention to be in the 9th Century, but others, much earlier.

ALBATEGNI.

A L B A T E G N I.

ALBATEGNI, a Syrian Prince, and famous Astronomer, lived in the 9th Century: He was a famous Adept in that Science; and wrote very curious Observations on the Sun, the Moon, the fixed Stars, and the oblique Figure of the Zodiac: He was also known by the Name of *Mahomet* of *Aræti*, which is a City of *Chaldea*, where he spent the greatest Part of his Time, in the Study and Improvement of the Astronomical Science. *Venebrad, Vossius.*

A V I C E N N A.

AVICENNA was one of those learned *Arabs* with whom this Age abounded. He was a Native of *Bochara*, a Town in *Asia*, within the Dominions of *Persia*, in the Year of the *Hegira* 370.

At *Bochara*, he was instructed in the *Koran*, and polite Literature, and in the *Indian* Methods of *Arithmetic*, and; by an Itinerant Philosopher, was taught the Elements of *Geometry* and *Logic*: At sixteen Years of Age, he applied himself to the Study of *Physic*, as intending to make that his Profession; but; at the same Time, did not neglect the Study of *Logic*, *Natural Philosophy*, and the *Mathematics*; all which, he pursued with incredible Industry, and Application, so as to attain to a very high Perfection therein, and merit an extensive Fame; and when a very young Man, was recommended to the King of *Chorassan*, whom, by his Prescription, he recovered from a dangerous Illness. The King kept him, some Time, near his Person, and gave him free Access to his Library, said to be well stored with the most curious Books, which, however, was by some Accident, set on Fire, and all destroyed: *Avicennas's* Enemies laying the Blame on him, he retired to his own Country. At about 22 Years of Age, his Father died, and he was appointed Intendant of the Revenues of the adjacent Provinces, in his Father's Place

Place, but his Sovereign's Affairs taking an unhappy Turn, he left *Bochara*. He now retires to *Dagestan* to the Study of Physic, where he composed the first Book of his Canon, being a *Compendium* of the *Almagest*, and other Treatises. After this, he was Physician to the King of *Persia's* Mother, from whence he was removed to *Hamadan*, and was there preferred by its Sovereign to the Head of his Ministry; but he not proving a Friend to the military People, they by Violence forced him from that Prince's Protection, and put him in Prison; at the same Time soliciting the Prince to put him to death. However, to give them some Satisfaction, the Prince seemed to consent to his Banishment; but after a Concealment of 40 Days, and punishing the Leaders of the Sedition, *Avicenna* was again reinstated, and held his Place until the Death of his Sovereign. His Successor not employing him, he returned to the House of an Apothecary, and there finished his *Altheta*, so much of his Works as treats of Physics and Metaphysics, except the two Books of Animals and Plants.

During this Recess, he carried on a Correspondence with the *Sultan* of *Persia*, not on good Terms with the Sovereign of *Hamadan*, which being discovered, he was imprisoned in the Castle of *Berdawen*, where he lay four Months, and was then carried back to, and imprisoned at *Hamadan*, from whence he made his Escape in the Habit of a *Jûsi*, and got to *Ispahan*, where he was by the *Sultan* honourably received.

In this City, he wrote many of his Works, which were almost an incredible Number. That, named the Canon, acquired him the greatest Repute, being epitomised, and commented upon by many learned *Arabian* Writers in the 12th and 13th Centuries: And long before prevailed so greatly in *Europe*, that no other Doctrine was taught in the Schools of Physic till the Restoration of Learning, and a new Mode of Medicine. He likewise wrote of the liberal Arts in general, and died of the Cholic at *Hamadan*, whither he attended the *Sultan* of *Persia* in the Year of the *Hejira* 428, aged 58. He was naturally of a good Constitution, but was not the same Philosopher in Practice as in Theory, having, it is said, shortened his Days by a much too free use of Wine and Women.

ALBERTUS MAGNUS,

A *Dominican Bishop of Ratisbon, of the 13th Century. Mo-*
rer gives us a large Detail of the Employments conferred upon
 him, and the Success of his Lectures in several Towns, &c. But
 we shall not render our Account of him tedious by these Particu-
 lars. That his Disquisitions were an Argument of his Abili-
 ties and Inclination to investigate the Nature and Proper-
 ties of many Things is apparent, and particularly of some
 Things, which were concealed from the Penetration of the
 Vulgar. It is said of him, that he was extremely inquisitive in
 his Temper, which probably occasioned some Reflections to be
 cast on him; such as, that he was in Search of the Philosopher's
 Stone; that he was a Magician, &c. the Occasion of which
 was, that from his Skill in the Mathematics, and uncommon
 Ingenuity in Mechanics, he had made a Head, which, by the
 help of Strings, would form articulate Sounds. He is said to be
 a very great Writer, his Works amounting to 21 Volumes in
 Folio, in the Edition of *Lions* 1651. It is great Pity there is
 so much of incredible Romance interspersed in this Philosopher's
 Life, which, if not intended to eclipse his Character, has this
 Tendency at least to obscure it.

ROGER BACON.

ROGER BACON was a learned *English* Monk, of the
Franciscan Order, who flourished in the 13th Century.
 He was born near *Ilchester* in *Somersetshire*, which is held to be
 the *Isca* of *Ptolomy*, some Time in the Year 1214, and was de-
 scended of a very antient and honourable Family. He received
 the first Tincture of Learning at *Oxford*, where having gone
 through Grammar and Logic, the superior Strength of his Ge-
 nius was so conspicuous, that it gained him the Favour and Pa-
 tronage of the greatest Lovers of Learning, and such as were
 equally distinguished by their high Rank, and the Excellence of
 their

their Knowledge, of which, even in that Age, there were not a few. When he arrived at Years sufficient to qualify himself for academical Learning, he went over to *Paris*, where he made still greater Progress in all Sorts of Learning; insomuch, that he was looked upon as the Glory of that University, and an Honour to his Country. It was the Fashion then for such as desired to distinguish themselves by an early and effectual Application to their Studies, to resort to that City, where, at this Time, not only many of the greatest Men in *Europe* resided and taught, but many of the *English* Nation, by whom *Bacon* was highly encouraged and caressed; particularly by *Robert Grossetest*, afterward Bishop of *Lincoln*, and since his Patron. While he remained here, he did not confine his Studies to any particular Branch of Literature, but endeavoured to acquaint himself with Sciences in general, not in a superficial, but in the most perfect Manner, that the most constant Application, in the Use of right Methods, would enable him to do. When he had attained the Degree of Doctor, he returned again to his own Country, and took on him the Habit of the *Franciscan* Order, in 1240, when he was about 26 Years of Age. Others assert, that he became a Monk in *France*. However that be, on his Return to *Oxford*, he was considered as the greatest Man of the University, and the most assiduous and indefatigable in his Studies to acquire Knowledge, by which he gained the proportionable Esteem and Honour which his Abilities merited; but likewise perceiving, that the Course he took of improving and advancing the Sciences, by Experiments, required other Assistance than that of Books or Favour, they generously contributed out of their Purses; so that, as he tells us himself, within the Compass of twenty Years, he spent no less than 2000*l.* in collecting curious Authors, in making Trials of various Kinds, and in the Construction of different Instruments for the Improvement of useful Knowledge. But if this assiduous Application to his Studies, and the surprizing Progress he made in them raised his Credit with the more ingenious Part of Mankind, it excited Envy in some, and afforded plausible Pretences for covering the malicious Designs of others. It is very easy to conceive, that the Experiments he made in all Parts of natural Philosophy and the Mathematics must have made a great Noise in an ignorant Age, when very few Men were in any tolerable Measure

sure acquainted with those Studies; and when many Pretenders to Knowledge affected to cover their Ignorance by aspersing those Branches of Science which they wanted Genius to understand. They gave out, therefore, that mathematical Studies were in some Measure allied to the magical Arts, which the Church had condemned; and therefore brought sufficient Suspicions on those, whose Learning ought to have defended them from such Imputations. It was under Colour of such kind of Suspicion, that *Bacon's* first Troubles began, which issued in restraining him from reading Lectures to the young Students in the University; and at Length, ended in a close Confinement, in which he was almost starved; and under a Prohibition not to send his Writings beyond the Limits of his Convent, except to the Pope. But there is also great Reason to believe, that though his Application to the occult Sciences was pretended; yet the other Cause of his ill Usage was the Freedom with which he had treated the Clergy in his Writings, in which he had spared neither their Ignorance, nor their Want of Morals. Besides, his great Intimacy with Bishop *Grouthead* might add not a little to the Power, as well as Spirit of Persecution; for that Prelate had gone so far as to reprove Pope *Innocent* IV. by Letter, and is said to make no Scruple of declaring, that the *Pope* was *Antichrist*. Our Author, being his Bosom Friend, incurred on him the Hatred of a great Part of the Clergy; more especially, since his Zeal led him to follow the Practice as well as the Opinion of his Patron, by writing freely to the Pope about the Necessity of a Reformation; and it appears clearly, that the great Motive which induced *Roger Bacon* to embrace a monastic Life was, that he might have greater Leisure to attend his Studies, and that he was desirous, that all his Discoveries should tend to the Advancement of useful Knowledge, which he thought of the highest Consequence to the Honour and Peace of the Church; and in his Writings, he takes great Pains to shew, that the perfecting natural Philosophy was the surest Method of extirpating all Heresies and Superstition, and destroying the Kingdom of *Antichrist*; as the perfecting moral Philosophy was the most effectual Means of establishing true Religion in the Hearts of Men; and shewing the Correspondence between the Laws of Nature and the Doctrines of the Gospel.

In

In his Address to Pope *Clement* the IVth, he says, that “ out
“ of a Reverence due to his high Dignity, which ought to en-
“ gage him in seeking to procure the Benefit of the whole
“ World, he was willing, as far as the Impediments he la-
“ boured under would permit, and his Memory would allow,
“ to deduce a regular System of true Philosophy to the utmost
“ of his Power.” This he always declared was his Study, in
Subservience to the Interest of true Religion. If his Society
would have indulged him in the Education of Youth, that a
new Turn might have been given to their Studies, we may easi-
ly conceive, what a new Face it would have given to the Affairs
of Learning, and how advantageous it would have been to the
whole Christian World; since our Author, by Dint of his own
Penetration, and a right Use of experimental Philosophy, arrived
at, and even perfected many of those Discoveries which have
done so much Honour to the Moderns; and which, by enquir-
ing into, and publishing his Writings, it is unquestionably ma-
nifest, might have been long ago known. If our Author had
not been treated as he was, or if there had not been such a tyra-
nical Power exercised in the Christian Church, as put it out of
the Power of private Men of Capacity to spread their Discove-
ries, and to render the Progress they made in the Knowledge of
Sciences public as they now do; but, notwithstanding this base and
barbarous Usage from those, who, of all others, ought to have
behaved towards him in a different Manner, his Reputation con-
tinued to spread itself over the Christian World: Insomuch, that
Pope *Clement* IV. one of the wisest and worthiest Men of that
Dignity, wrote him a Letter, desiring he would send him his
Works. This was in 1266, when our Author was in the Flow-
er of his Age, and who, to gratify his Holiness, collected toge-
ther, enlarged, and ranged in some Order, and sent them the
next Year. This Collection is the same with that he himself
intitles, *Opus Majus*; or his great Work; yet extant. This
learned Book of his procured him the Favour of that Pontiff, and
also some Encouragement in the Prosecution of his Studies; but
this proved but a transient Pleasure, the Pope dying not long after;
and then we find our Author under new Difficulties from the
same Causes as before; but the Storm now rose higher, and the

General of his Order, *Jerome de Esculo*, having heard his Cause, ordered him to be imprisoned; this is said to be in the Year 1278, who likewise, to prevent his appealing to Pope *Nicholas*, procured a Confirmation of his Sentence from *Rome* immediately; but it is not very easy to say, upon what Pretences this Condemnation was founded. There have been various Accounts, and generally thought to be on Account of his *Alchimistical* Treatise. However obscure the Nature and Circumstances of his Troubles may be, thus much is certain, they endured for many Years, and must have brought him very low; since he was 64 Years of Age, when he was first put in Prison; consequently, less able to sustain the Hardships he endured, which were encreased by his being deprived of the Opportunity of prosecuting his Studies; at least, in the Way of Experiments; but that he was indulged the Use of his Books, at least the latter Part of the Time, appears from the learned Works he composed even under his Imprisonment.

Pope *Nicholas* the 3d dying in the Year 1280, *Simon de Brie*, Cardinal of St. *Cecilia*, was elected Pope, who held that Dignity 4 Years, and was then succeeded by Cardinal *Savelli*, who assumed the Name of *Honorius* IV. in the Year 1285, whose Reign was very short, and full of Trouble; so that it is not to be much wondered at, that in all this Time, our Author could not find an Opportunity of applying to the Holy See for the Mitigation, or Repeal of the Sentence; but when he had been ten Years in Prison, *Jerome de Esculo*, who had condemned his Doctrine, was chosen Pope, and assumed the Name of *Nicholas* IV; and as he was the First of the *Franciscan* Order that had ever arrived at this Dignity, he was reputed a Person of great Probity, and much Learning. Our Author, notwithstanding what had before happened, resolved to apply to him for his Discharge; and in order to pacify his Resentment, and at the same Time to shew both the Innocence and Usefulness of his Studies, he addressed to him a very learned and curious Treatise, on the Means of avoiding the Infirmities of old Age. It does not appear, however, that either his Application, or the Method he took to soften his Holiness's Temper, had any great Effect; on the Contrary, some Writers say, he caused him to be more closely confined. But how-

The LIFE of ROGER BACON. 131

however that be, towards the latter End of his Reign, Friar Bacon, by the Interposition of some Noblemen, obtained his Release, and returned to *Oxford*, where, at the Request of his Friends, and very probably of those who were instrumental in obtaining his Liberty, he composed, old as he was, and after all the hard Usage he had met with, a *Compendium of Theology*, which seems to have been his last Work. He spent the Remainder of his Days in Peace; and dying in the College of his Order, on the 11th of *June* 1292, he was interred in the Church of the *Franciscans*. These are all the remarkable Circumstances, that with the utmost Care and Diligence we have been able to collect concerning the Life and Actions of this great Man, whose deep Science and vast Penetration enabled him to make such a prodigious Progress in all useful Knowledge, that even the wisest of Men in latter Times read his Works with Astonishment, and readily confessed, that he was well distinguished by the Title the Monks gave him of *Doctor Mirabilis*, or the *wonderful Doctor*, which most certainly he deserved in whatever Sense the Phrase is taken. But as this general Character of him is not answerable to his Merit, we shall enter on a more exact, authentic, and particular Display of his Discoveries. If by doing this methodically, we can set his Merits in a clearer Light, we hope to add to the Pleasure of the ingenious Reader.

To begin then with the Languages, which he thought the Foundation of all true Learning, as being absolutely necessary to the Perusal of the best Authors in several Sciences, in their Originals; he not only understood them sufficiently for that Purpose; but was also a perfect Master of the *Latin*, *Greek*, and *Hebrew*. Of this he has given such indubitable Proof in his Writings, as must of itself have secured him a very high Character, more especially considering the Age in which he lived, if he had not distinguished himself in any other Branch of Literature.

In all Branches of the *Mathematics* he was wonderfully well versed, and there is scarce any Part of them on which he has not written with a Solidity and Clearness, which have been deservedly admired by the greatest Masters in that Kind of Science.

In respect to *Mechanics* particularly, the learned *Doctor Freind* says

says very justly, that a greater Genius had not arisen since the Days of *Archimedes* ; the Truth of which the Reader will readily allow, when he has considered the Contents of a single Page of one of his Treatises.

He understood likewise the whole Science of *Optics* to a surprising Degree of Accuracy and Exactness, and is very justly allowed to have understood the Theory and Practice of those Discoveries which have bestowed such high Reputation on those of our own, and other Nations.

In respect to the Science of *Perspective*, he took incredible Pains, and spent considerable Sums, that he might bring into some Method a Science, which was then understood but by very few ; and he tells us, that no Lectures had been read upon it at *Paris*, and but twice at *Oxford*.

It will be proper here to observe, that the most conspicuous Part of the Character of this great Man is, his being conversant chiefly about the useful Inventions of *Optical Glasses* and *Instruments* ; a short Account of which, we presume, will be agreeable to the Reader, and which, therefore, we shall collect from the Writings of Mr. *Molyneux*. And, first, concerning *Optic Glasses* Mr. *Molyneux* has the following Passage, “ That this
“ learned Friar *Bacon* did perfectly understand all Sorts of *Optic*
“ *Glasses*, shall be plainly made out from the natural and easy
“ Sense of his own Words, in his Book of *Perspective*, whereby we
“ shall find, that he not only understood the Effects of single *Con-*
“ *vex*, and *Concave Glasses*, but knew, likewise, the Way of com-
“ bining them so as to compose some such Instrument, as our Te-
“ lescope.” This perhaps will be looked upon as a great Paradox, and as great Partiality in an *English* Author to his Countryman ; especially, considering how universally the Contrary has prevailed, the Votes of most learned Men having conferred the Honour of this Invention on other Pretenders ; but if, from the unconstrained Words of his Book, we plainly make out this Assertion, I hope the Attempt may not be thought unreasonable, or partial.

And first, in this Book of *Perspective* he has these Words, *Si vero corpora non sunt plana* (having treated of them before) *per quæ visus videt, sed spherica ; tunc est magna diversitas, nam vel concavi-*
tas

tas Corporis est versus Oculum, vel Convexitas, &c. by which it is manifest, he knew what a *Concave* and *Convex* Glass was. Moreover, in the same Place he proceeds thus; *De Visione fractâ majora sunt; nam de facili patet maxima posse apparere minima, & è contra; & longe distantia videbuntur Propinquissimè, & è conversò. Sic etiam faceremus Solem & Lunam & Stellâs descendere secundum Apparentiam hic inferias, &c.* Thus in *English*; greater Wonders than all these are performed by *refracted Vision*; for thereby it is easily made appear, that the greatest Object may be represented as very little, and contrarily; and so likewise the most distant Objects as just at hand, and contrarily. Hereby also we may bring the Sun, Moon, and Stars, down here below, in Appearance, &c. This, I think, is so express in the Point, that it leaves no Room to doubt, but that he had some admirable Secret in Optic Glasses. Add to this what he has, in his Epistle *ad Parisiensem*, of the Secrets of Art and Nature. *Cap. 5. Possunt etiam sic figurari perspicua, ut longissimè posita appareant propinquissima & è contrario. Ita quod ex incredibili Distantiâ legerimus literas minutissimas, & numeraremus res quantumcunque parvas, et Stellâs faceremus apparere quò vellemus.* Glasses or Diaphonous Bodies, says he, may be so formed, that the most remote Objects may appear as just at hand, and contrarily, so that we may read the smallest Letters at an incredible Distance, and may number Things tho' ever so small, and may make the Stars appear as near as we please. And that these Things may not appear incredible of this great Man, who, in that dark, and ignorant Age, could be Master of these admirable Inventions; I shall refer the Reader for a more compleat Account of him to Dr. *Plott's* Natural History of *Oxfordshire*. *Cap. 9. Sect. 2, 3. &c. and Sect. 39, 40, 41.*

Concerning the forementioned Account of Mr. Molyneux Dr. Smith has the following Remarks.

Mr. *Molyneaux's* Quotations from Friar *Bacon* being imperfect, by reason of his Absence from Books, as he informs us, I will here supply this Defect. This Author having described several Canons, as he calls them, for shewing the visual Angle under which an Object appears by Refractions through a Plane and spherical Surface, and also the Place of its Image, proceeds im-

mediately to apply them to the Solution of several Appearances. As why an Oar appears crooked in the Water ; why a Piece of Money in the Bottom of a Bason becomes visible, by pouring in Water, when before that, it could not be seen over the Side of the Bason ; why the Sun and Moon appear larger than ordinary through dense Vapours in the Horizon ; and at last, he adds ; *Si verò Homo aspiciat literas, &c.* Which in *English* is thus ; “ If the Letters of a Book, or any minute Objects be viewed through a lesser Segment of a Sphere of Glass, or Chrystal, whose plain Base is laid upon them, they will appear far better and larger. Because, by the fifth Canon about a spherical Medium, its Convexity is towards the Eye, and the Object is placed below it, and between the Convexity and its Centre, all Things concur to magnify it. For the Angle under which it is seen is greater, and its Image is also greater, and nearer to the Eye than the Object itself ; because the Object is between the Centre and the Eye ; and therefore this Instrument is useful to old Men, and to those that have weak Eyes ; for they may see the smallest Letters sufficiently magnified. But if the Medium be the longer Segment of a Sphere, or but Half a one, then, by the sixth Canon, the apparent visual Angle will be greater than the true one, and the Image also greater than the Object ; but the Place of it will be beyond the Object ; because the Centre of the Sphere is between the Eye and the Object. And therefore this Instrument is not so powerful in magnifying, as a lesser Segment of a Sphere. Also Instruments, made of chrystal Bodies with plane Surfaces, by the first and second Canons about spherical Surfaces, will perform the same Thing. But the lesser of two Segments of a Sphere magnifies more manifestly than any of them all, by Reason of the Concurrence of all the three Causes, as I said before.”

To find an Author speaking of a small Segment ; of its magnifying the Letters of a Book ; of its being a proper Instrument for helping decayed Sight ; and to say he was not possessed either of the Theory, or the Use of Spectacles, may appear to be a Paradox ; but I hope to satisfy my Readers, that it is not a Mistake. First, then our Author plainly proposed to lay the flat Base of his Segment upon the Letters. For the Word *Suppositi* must have been a Contraction in his Writing of the Word *Superpositi*, or rather *Superimpositi* ; as appears by the Sequel, and by the Ca

non he quotes. Besides, he says not a Word of holding the Segment at a Distance from the Letters ; nor could he indeed ; because he has not treated of a double Refraction at both its Surfaces ; without which, he could conclude nothing at all about its Effects, when raised from the Book ; for he argues from Nothing but Theory throughout the whole Chapter.

Here the Doctor observes, that *Bacon's* Conclusions are just contrary to what the Theory of Optics dictates, and what is found true by Experiments : And having pointed out the same very particularly, then he proceeds.

Hence it is plain, says he, that our Author tried no Experiments with a greater and a lesser Segment to compare their Effects together ; for then he must have found out his Mistake, and must rather have preferred the larger Segment for magnifying more, which is all he contends for. However, let us suppose him to have followed his own Doctrine, and to have tried a lesser Segment only, it could not be a thin Segment of a large Sphere, like one of our Spectacle-Glasses. For this could not sensibly magnify the Letters underneath it, as he said it did. The most convex Spectacles now made, when laid upon a Book, have not this Effect ; because they are too thin. It follows then, if he tried any Segment at all, that it must have been a Segment of a small Sphere, sufficiently thick to magnify the Letters underneath it ; and therefore must have been thicker than our deepest Spectacles for the oldest Men's Eyes ; and consequently, when applied to their Eyes, it must have made the Letters appear confused, by too great a Quantity of the Refractions ; and this Confusion our Author could not correct by Theory and Reason, because he knew not the Cause of it ; and it is plain, he made not many Experiments. The Discovery of this Cause, together with the Manner of Vision by Pictures upon the Retina, was first made by *Kepler*, about 300 Years after our Author's Time, and also after Spectacles were in common Use. It was impossible then for any Man before *Kepler*, ever to explain the Effect of Spectacles, (that is, how they correct the Confusion in the Picture upon the Retina) and much more to invent them by Theory and Reason ; and consequently, they must have been the Result of some lucky Accident among a Multitude of Tryals and

M m 2 Attempts,

Attempts, begun perhaps upon this Hint of our Authors ; which is all the Honour that can justly be paid him.

As to his Theory and Applications above-mentioned, they are all taken from *Alhazen*, an *Arabic* Author, whom he frequently mentions upon other Occasions. *Alhazen* is reckoned to have lived about the Year of our Lord, 1100. Among his Experiments, to explain his Theorems, he expressly mentions, that if an Object be applied close to the Base of a larger Segment of a Sphere of Glass, it will appear magnified. He also treats about the Appearance of an Object through a Globe ; and says, he is the first that found out the Refraction of Rays into the Eye.

Thus far concerning his Knowledge in Optical Glasses. After this, the Doctor proceeds to examine Friar *Bacon's* Pretence to the Invention of Telescopes, which most People from his Writings suppose he was well acquainted with ; and imagine, if he was not the first Author of it, he must certainly have had a considerable Share in the Improvement thereof : For thus Mr. William *Molyneux*, we have already observed, ascribes the Invention of Telescopes expressly to Friar *Bacon* ; and his Son, the Honourable *Samuel Molyneux*, has declared his Opinion rather more expressly ; that the Invention of Telescopes, in its first Original, was certainly put in Practice by an *Englishman*, Friar *Bacon* ; although its first Application to astronomical Purposes may be justly attributed to *Galileo*. To examine this Opinion of those learned and judicious Persons, (says Dr. *Smith*) it will be necessary to translate one whole Chapter of our Author's upon Vision by Refractions, which immediately follows after his Discourse upon Vision by Reflections, which is thus in English.

“ Greater Things than these may be performed by refracted Vision. For it is easy to observe, by the Canons above-mentioned, that the greatest Things may appear exceeding small, and on the contrary ; also that the remote Objects may appear just at hand, and on the contrary. For we can give such Figures to transparent Bodies, and dispose them in such Order, with respect to the Eye and the Objects, that the Rays shall be refracted and bent to any Place we please ; and thus from an incredible Distance we may read the smallest Letters, and may number the smallest Particles of Dust and Sand, by reason of the Greatness of the Angle under which we may see them ; and on the

contrary, we may not be able to see the greatest Bodies just by us, by Reason of the Smallness of the Angles under which they may appear. For Distance does not affect this Kind of Vision, excepting by Accident, but the Quantity of the Angle. And thus a Boy may appear to be a Giant, and a Man as big as a Mountain; forasmuch as we may see the Man under as great an Angle as the Mountain, and as near as we please. And thus a small Army may appear a very great one, and tho' very far off, yet very near us, and on the contrary. Thus, also, the Sun, Moon, and Stars, may be made to descend hither, in Appearance, and to appear over the Heads of our Enemies; and many Things of the like Sort, which would astonish unskilful Persons."

The same Author has also told us, That by several *Speculums*, properly disposed, a single Soldier may be multiplied so as to appear like an Army; and one Army like many Armies, terrifying Infidels and Enemies; That *Speculums* may be raised up on high against opposite Armies, and so as to discover all the Enemy's hidden Transactions, and that this may be done from any Distance whatever. Because, by the *Book* upon *Speculums*, one, and the same Thing may be seen by Reflection from as many *Speculums* as we please, if they be disposed in proper Situations; and therefore, some may be placed nearer, and some farther off; so that the Object may be seen from any Distance whatever. *Ut videremus rem quantum à longè vellemus.*

We have added this Extract to the other Passage, to shew that his Thoughts about the Manner of executing these Designs, by Reflection and Refractions, are much alike, as is evident from the Passage last mentioned, compared with this; *Figurare perspicua sed longè magis quam hæc oporteret homines haberi; qui benè, immò optimè, scirent perspectivam, & instrumenta ejus; — quia instrumenta astronomica non vadunt, nisi per visionem, secundum legis istius scientiæ: To dispose the Glasses in such Order, with Respect to the Eye and Objects, that the Rays shall be refracted, and bent to any Place we please.*

It seems, then, as if he did not think of performing these Problems by a single, portable Instrument, like a Telescope; but by fixing up several Glasses at large Intervals from one another; which would certainly prove ineffectual. Because no

Surfaces can be figured, and polished so perfectly, as to reflect, and refract Light, at a very great Distance, without great Aberrations, or Stragglings of the Rays, from the Places, or Points intended; and these Aberrations would be increased by the Interposition of more Glasses; to say nothing of the Loss of Light at every Surface, and of Colours generated by Refractions, from such great Distances; so that the Object must appear at last so faint, so deformed, and confused, as to excite no determinate Ideas.

What he mentions of *Julius Cæsar*, that he raised up *Speculums* to a great Height, upon the Coast of *France*, to discover the Disposition of the Cities and Camps in *England*, when he was going to invade it, is therefore impracticable, and probably a Fiction, if there be not a Mistake in the Interpretation of the Word *Specula*, for Glasses, instead of a *Watch-Tower*. The same is to be understood of the Story mentioned by *Parta*, that *Ptolomy*, by *Speculums*, could discern Ships at the Distance of 600 Miles; which could not possibly be done by our best Telescopes. Mr. *Waller* imagines, that he had his Intelligence by *Speculis*, or *Watch-Towers*, placed at several intermediate Distances; where several Signs might be given and received successively from the first to the last.

But to return to our Author, considering the false Nations he had from the Antients about distinct and confused Vision; the false Principle he maintains, that the apparent Magnitude of an Object is as the Angle subtended at the Eye by its Image, and reciprocally, as the Distance of the Image too; and lastly, the false Conclusions he has drawn, and must always draw, from these Principles, as we have shewn in his Attempt upon making Spectacles; it was certainly next to impossible for him to have invented, by Theory, a much nicer, and more complex Instrument; I mean, a Telescope of any Sort. Indeed, Mr. *Molyneux* says, it is manifest, he knew what a concave and convex Glass was. But this does not appear from the Passage there cited, nor from any other that I have met with. Mr. *Molyneux* was misled by the Inaccuracy of the Author's Language. *Si verè corpora non sint plana per quæ visus videt, sed sphaerica, &c.* instead of this he should have said, *Si verè corporum superficies non sint plana, per quas visas videt, sed sphaerica, &c.* For in this whole

whole Chapter, he treats of nothing else but the Appearance of an Object thro' a single concave or convex Surface of a large Body or Medium, the Object being placed within it, and not beyond it. Nor do I find, that he has ever considered the Appearance of an Object placed at a Distance, beyond a refracting Body of any Shape. Indeed, he mentions the Refractions of the Sun's Rays thro' a Sphere, to shew how they burn Things; but not a Word how an Object appears thro' it.

Besides, we have shewn, that he never had handled a Convex-spectacle-glass, when he wrote a Passage in this same Treatise; and without a Variety of Lenses, he could try but few Experiments, and could never have hit upon a proper Combination of them for a Telescope. Indeed, Dr. *Jebb*, the Editor of the last Edition of the *Opus Majus*, in his Dedication to Dr. *Mead*, produces a Passage from a Manuscript to shew, that this Author actually applied Telescopes to astronomical Purposes. *Sed longè Magis, &c.* to this it may be answered, that the Antients had some Occasion for Perspective in plain Instruments, before the Invention of Telescopic Ones. But as this Passage stands alone, it is not easy to know the Intent of it; however, had there been any more to the like Purpose, no Doubt this Gentleman, so much versed in this Author's Works, would have found them out, and obliged us with them.

In short, this Author speaks only hypothetically; saying, that Glasses may be figured, and Objects may be magnified so and so; but never asserts one single Trial, or Observation upon the Sun or Moon, (or any Thing else) tho' he mentions them both. On the other Hand, he conceives some Effects of Telescopes, that cannot possibly be performed by them.

If it be asked how he came by these Notions? I answer, from the common Doctrine of Refractions in his Canons, and from common Appearances by Refraction and Reflection; especially from concave *Speculums*, whose Effects were well known to him, both by the Accounts of them in antient Authors, and by his own Experience. And this I take to be a sufficient Ground for a Man of good Sense and Fancy to produce all that he has said. We may however conclude, that the Time of the Invention of Telescopes was not earlier than the seventeenth Century.

tury. But it may be thought high Time to proceed to other Instances of our Author's Genius and Improvements.

Geography also he was peculiarly well skilled in, as appears from a Variety of Passages in his Works, which shew, that he was far better acquainted with the Situation, Extent, and Inhabitants, even of the most distant Countries, than many who made that particular Science their Study, and wrote upon it in succeeding Times. This may be the Reason which induced the judicious *Hackluyt* to transcribe a large Discourse out of his Writings into his Collection of Voyages and Travels.

But his Skill in *Astronomy* was still more surprizing; since it plainly appears, that he not only pointed out that Error which occasioned the Reformation of the Kalendar, that has given Rise to the Distinction about the Old-stile and the New; but also afforded a much more effectual and perfect Reformation than this, which was made in the Time of Pope *Gregory XIII.* This is abundantly illustrated in his Book, intituled, *Opus Majus*, from whence we shall make only the following Extract. “*Julius Cæsar*, says he, p. 169, being well skilled in *Astronomy*, settled, as well as it was possible in his Time, the *Kalendar*; but *Julius*, however, did not discover the exact Length of the Year; for he has fixed it in our *Kalendar*, at 365 Days, and the Fourth of a Day, which fourth Part is collected once in four Years; so that in the *Bissextile* Year, one Day more is reckoned, in every fourth Year, than in the common Years. It is, however, manifest, not only by the old and new Computations, but is also known from astronomical Observations, that the Solar Year is not of that Length, but somewhat shorter; and this small Difference wise Men have computed to be the 130th Part of a Day; so that in the Space of 130 Years, there is a superfluous Day taken in, which if it were taken away, our *Kalendar* would be corrected as to this Fault; and therefore, as all Things in our Computation depend upon the Quantity of the Solar Year, it is necessary to recede from this Position, when it thus appears to be a fundamental Error. From hence there arises still a greater Error, that is, in fixing the *Equinoxes* and *Solstices*; and this Error not only arises from the Quantity of the Year, but has also several mischievous Consequences; for the *Equinoxes* and *Solstices* are thereby fixed to certain Days, as if they were really upon them,

and

The LIFE of ROGER BACON. 141

and were so to happen for ever. But it is certain from *Astronomy*, which cannot lie, that they ascend in the *Kalendar*, as by the Help of Tables and Instruments may be unquestionably proved.

There are also remaining some Works of his relating to *Chronology*, which would have been thought worthy of very particular Notice, if his Skill in other Sciences had not made his Proficiency in this Branch of Knowledge the less remarkable. But it may not be amiss to observe, that he was perfectly well versed in the History of the four great Empires of the World, of which he has treated very accurately tho' succinctly, in his great Work addressed to Pope *Clement IV.*

Our Author was likewise well acquainted with *Chemistry*, at a Time too that it was scarcely known in *Europe*, tho' it had been long cultivated among the *Arabians*. Dr. *Freind* says truly, it is no more than doing Justice, to ascribe the Honour of introducing it to this our Countryman, who, as he likewise says, speaks in some Part or other of his Works, of almost every Operation now used in *Chemistry*, and describes the Method of making *Tinctures* and *Elixirs*, &c.*

But we must not so superficially pass over his Excellency in this Art, since there are no less than three capital Discoveries made by him, which deserve to be particularly considered. The first is, the Invention of Gun-powder, which, however confidently ascribed to Others, was unquestionably known to him, both in regard to its Ingredients and Effects. Thus, in his 6th Chapter of *the Secrets of Nature and Art*, he tells us, "That from *Salt-Petre*, and other Ingredients, we are able to make a Fire, that shall burn at what Distance we please. He likewise mentions other Methods of doing the same Thing; and then, speaking of the Effects of these strange Fires, he says, "That Sounds, like Thunder, and Coruscations, may be formed in the Air, and even with greater Horror, than those which happen naturally; for a little Matter, properly dispersed, about the Bigness of a Man's Thumb, makes a dreadful Noise, and occasions a prodigious Coruscation, and this, says he, is done several ways; by which a City, or an Army, may be destroyed after the Manner of *Gideon's* Stratagem, who having broke the

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Pitchers

* See, *Freind's History of Physic*, Vol. 2. p. 234.

Pitchers and Lamps, and the Fire issuing out with an inexpressible Noise, killed an infinite Number of the *Midianites*." This very plainly proves, that he knew the Effects that such a Composition as what we now call Gun-powder would produce.

Another remarkable Discovery we may mention is that, which commonly goes under the Name of *Alchemy*, or the *Art of transmuting Metals*, of which he has left many Treatises; some published, and some still remaining in MS. which, whatever they may be thought of now, procured him the Reputation of an Adept, among the greatest Masters in that mysterious Branch of Learning, and in which Writings there are, without doubt, a Multitude of curious and useful Passages, which, independent of their principal Subject, will render them always valuable.

But that for which our Author was much more celebrated, was a Discovery in *Chemistry*, viz. a *Tincture of Gold*, for the Prolongation of Life, of which Dr. *Freind* says, he has given Hints in his Writings, and which it is very probable, he would have laid open more fully, if his Discourses upon these, and other important Subjects, had been received with the Candor they deserved. As it is, he has said enough to shew, that he was no Pretender to this Art, but understood as much of it, in this respect at least, as any who have lived since his Time.

That he was far from being unskilled in the Art of Physic, we may rationally conclude, from his extensive Knowledge in those Sciences which have the nearest Relation thereto; but besides this, we have a particular and manifest Proof of his perfect Acquaintance with the most material and useful Branches of Physic, in his Treatise of *Old Age*, which, as Dr. *Freind*, whose Authority on that Subject cannot well be disputed, observes, is very far from being ill wrote; and Dr. *Brown*, who published it in *English*, esteemed it one of the best Performances that ever was written. In this Work he has collected whatever he has met with upon the Subject, either in the *Greek* or *Arabian* Authors, and has added a great many Remarks of his own. The Whole, considering the Time in which it was wrote, is, in Reality, a very extraordinary Performance, both in Point of Learning and Judgment, and will appear the more curious and the more valuable, the oftener it is read, and the more it is considered.

The LIFE of ROGER BACON. 143

In *Law* and *Metaphysics* he was admirably well versed, as appears by those Parts of his Works, in which he has treated of these Subjects.

Neither was he unskilful in *Philology*, and the politer Parts of Learning, as might be demonstrated from his Writings; wherein he particularly complains, that in his Time, *Grammar* was at a very low Ebb; and as for the learned Languages, they were not understood, at least to any tolerable Degree, but by very few; so that his own Acquirements in these Respects is so much the more remarkable.

In *Ethics*, or *Moral Philosophy*, he was a great Master; and as he was a Man of distinguished Sense and unblemished Probity, so he has laid down the noblest, and most generous Principles for the Conduct of human Life. In the Treatise he has left us upon that Subject, he describes *Morality* in a peculiarly just, and rational Manner, and represents *Moral Philosophy*, as the End and Perfection of all human Knowledge. He considered all speculative Science as useful or useless, in Proportion as it contributed to the Advantage of Mankind. He declares, that, in his Judgment, the *Moral Philosophy* of Christians is the same with their *Divinity*; and that, tho' it is by far more perfect than the Philosophy of the *Pagans*; yet it rests upon, and takes in their Principles; so that, in short, he makes *Natural Religion* the Ground-work, and *Revealed* the Structure, supposing each necessary to the other, and therefore not to be separated or divided.

But as his Profession and Course of Life required a particular Application to *Theology*, so it plainly appears, that he made all his other Studies subservient thereto, and directed both his Actions and his Writings to the Glory of God, and the Good of his Fellow-Creatures. He had the highest Deference for the *Holy Scriptures*, and thought, that in them were contained the Principles of true Science, and of all useful Knowledge. He therefore earnestly recommended the Study of them in their original Languages, and an assiduous Application to the several Branches of Learning, which he thought necessary for the thorough understanding them. To say the Truth, the impressing this strongly on the Minds of Men, who made Religion their peculiar Profession, is the great Aim and Design of his Works: More especially of his last Treatise, which he left as a Kind of

Testament

Testament to those of his Order, and is a very excellent Work in its Kind.

As to the vulgar Imputation on his Character, of his leaning to *Magic*,* and that he had an high Opinion of *Judicial Astrology*, has been more than sufficiently confuted by the learned *Gabriel Nande*, and others; for, considering the Ignorance and Superstition of the Age in which he lived, it required great Discernment, Confidence, and Resolution, to oppose the common received Errors; and, as his whole Life was spent in Labour and Study, and as he was continually employ'd either in writing for the Information of the World, or in reading, or making such Experiments as might enable him to write with greater Accuracy; so we need not wonder, that his Works were so exceedingly numerous; especially, when it is considered, that, on the one Hand, his Studies took in the whole Circle of the Sciences, and that, on the Other, the numerous Treatises ascribed to him are often, in Fact, but so many Chapters, Sections, or Divisions; and sometimes we have the same Pieces under two or three different Names; so that it is not at all strange, before these Points were well examined, that the Accounts we have of his Writings appeared very perplexed and confused. But notwithstanding this seeming Perplexity and Confusion, it is not a very difficult Thing, from the Lights we now have, to give a fair and just Account of our Author's Works, the far greater Part of which are still in Being; and it were to be wished, that they were also made public. It will likewise appear, from a Summary of his Works, what great Service has been done to the learned World by such as have made it their Business to collect, and preserve ancient MSS. and to bring together the scattered Memorials of those learned Men, who have flourished in past Times, and who, un-

* The infamous Character of a *Magician* was designedly, and industriously propagated amongst the ignorant and credulous Vulgar, by his professed and implacable Enemies. And it was not only the Fate of this great Man, but many others before, and since his Time, to be stigmatized with the opprobrious Titles of *Conjurors* and *Soothsayers*, by the Enemies of Science; when at the same Time, it may be observed, that no Sort of Men have held those ridiculous Superstitions in greater Detestation than themselves; and BACON was so far from pretending to any infernal Arts, that he wrote a Book expressly against them, under the Title of *DE NULLITATE MAGIÆ*; or the *Nullity of Magic*.

til this Care was taken, have been represented in very false Lights to Posterity.

It will also appear, that this excellent Person was very far from being a hasty, incorrect Writer; but that, on the contrary, all his Works have a just Reference to one great and general System, which he has executed, in all its Parts, to a much greater Degree of Perfection than hitherto even the Learned themselves have imagined.

The learned and industrious *Bayle*, by the Time he had finished his useful Collection, had met with, and digested the Titles of upwards of fourscore. *Pits* speaks with Amazement of the Multitude of Books written by our Author, and increases them to near an hundred. The learned Dr. *Jebb* has corrected and digested these Titles under the proper Heads of the Sciences to which they belong; so that the Whole of what was either written by, or attributed to our Author, according to this Account, were as follow:

In Grammar, 5.	Chemistry, 9.
Mathematics, Physics, &c.	Magic, 5.
22.	Logic, Metaphysics, and Ethics
Optics, 9.	8.
Geography, 6.	Physic, 9.
Astronomy, 7.	Theology, 6.
Chronology, 1.	Philology, and Miscellany, 12.

Upon the whole, we may safely affirm, that the History, Character, and Reputation of *Roger Bacon* is, in a great Measure restored; so that we may truly judge of them all, and determine, from the Light of Evidence, of the Usage he has received from all Parties. We may now justly applaud those learned Prelates of *Canterbury* and *Lincoln*, and all the great Men who were the Patrons of his junior Years, the Encouragers of his riper Studies, and the Protectors of his injured Innocence. We can plainly discern, how cruelly and unjustly he was persecuted by the malicious Monks of his Order, who envied that Learning which they ought to have imitated, and hated that Reputation it became them to admire. We know now, with Certainty, to what Popes he addressed his Writings, what those

Writings were, and why they were addressed to them. We can form a just Notion of the Reason, why he was honoured to so extraordinary a Degree by the most learned and most worthy Men of the Age in which he flourished; and how his Writings have been, in some Sort, the Standard of a true Taste for Science; that is to say, sought for, and admired when it prevailed; neglected, and misrepresented when ever it was clouded or obscured. We are now sensible of the Folly of those Prejudices, the Falshood of those Calumnies, and the Causes of those Mistakes which have been spread concerning our Author and his Writings. Lastly, we are enabled to discern, from the fullest and most authentic Evidence, the Justice and Sincerity of those Praises, which, in the highest Degree, have been bestow'd upon him by the ablest Writers, and best Judges of true and useful Knowledge, in our own, and in foreign Countries. 'Tis true, a great deal of Time and Pains have been employ'd, as indeed they were most necessary, to bring these several Points, with the Authorities requisite to support them, to the View of the Public; but when the Design of this Work is considered, the Merit of the Man duly weighed, together with the Glory which results to this Nation from having produced, and that too in one of the darkest and unlettered Ages, the brightest and most universal Genius that perhaps the World ever saw, before Sir *Isaac Newton*; it is hoped, that this Time and Pains, both with regard to the Reader and the Writer, will be esteemed properly employ'd.

REGIOMONTANUS.

JOHAN MULLER, called *Regiomontanus*, was born at *Mons Regius*, a Town in *France*, the 6th of *June*, 1436. His Parents, it is said, were Persons of good Repute, and in Circumstances sufficient, however, to bring him up to Learning.

The Seeds of Nature were planted in a happy Soil; for he had a ready and an acute Wit: But unless he had been inspired by a Sort of divine *Afflatus*, he could not have made himself complete.

complete Master of so many and such various Arts, have learned such a Number of Languages, undergone such immense Labours in informing himself and instructing others, in framing Instruments, contemplating the Situation of the Stars, writing the most learned Lucubrations, unfolding so many Intricacies, publishing Tables of his own as well as others, besides his *Ephemerides*, or *Journals*: I say, he could not have performed all these Things, in so short a Course of Life, unless he had been inspired with a Genius from Heaven. And indeed the Conservation of Arts and Sciences to Mankind is the special Favour of divine Providence; yet it is the Pleasure of the divine Being, that to his Liberality we should add our own Diligence and Assiduity; for he will not have his Gifts rejected with Disdain and Contempt, as is more fully intimated in the Parable of the Traders. Nor was it absurdly said by *Plato*, “That God and *Occasion* govern the Whole of the universal Work; yet a Third may be allowed, namely, *Art*, which must be joined with them.” As in a Ship, tho’ the Winds govern it, yet the Sailors are not idle; so we should with Reverence possess the divine Gifts, and with all our Diligence preserve and improve them.

Thus *Regiomontanus*, tho’ he had sufficient Strength both of Mind and Body for Learning; yet he did not neglect Assurances, nor, as many do, hunted after Riches and Pleasures; but with all his Powers and Faculties applied himself to his Studies, sought every-where for learned Men, by whose Wisdom he might be improved, and laboured incessantly to illustrate the Arts. For, after he had learned Grammar in his own Country, he was admitted, while yet a Boy, into the Academy at *Leipsick*, where he greedily imbibed the Elements of the Doctrine of the Sphere. But, having a great Desire of Instruction, required Directors for his Study, and Companions in so excellent a Labour; and hearing that at *Vienna* there was a College instituted on purpose for that Branch of Philosophy, he, tho’ very young, takes a Journey into *Austria*, where he finds *G. Purbachius Bavarus*, a most ingenious Man, and in the very Bloom of his Age and Authority. *Purbachius* no sooner discovered the Strength of Nature, and the Willingness of the Youth, than he embraced him; and became, not only his Adviser, but his

his Guide into the most secret Recesses of those Arts. It was thus the *Egyptian* Priests instructed *Theletes*, *Meton*, and *Eudoxus*; and *Eudoxus*, *Plato*, &c.

For about ten Years there was the closest Intimacy and Interchange of Sentiments between *Regiomontanus* and *Purbachius*; many Obscurities they elucidate; or observe, or discover the Motions of the celestial Bodies, and, in particular, that those of *Mars* did not agree with the Tables, but that sometimes there was a Variation of two Degrees; this induced them to begin a Correction of those Tables.

While they were thus employ'd, Cardinal *Bessarion*, a *Greek* by Nation, a Man of excellent Erudition, came Ambassador to the Emperor *Frederick*. Having questioned *Purbachius* in many Things relating to *Ptolemy's* System, and admiring his Dexterity in explaining them, requested him to compose an Epitome of his Work, entitled *The Great Syntax*. That Work, interrupted by the Death of *Purbachius*, was finished by *Regiomontanus*; because, as he himself informs us, *Purbachius*, on his Death-bed, among his last Requests, recommended this to him.

In which Affair, it is greatly to be admired, that, tho' unacquainted with the *Greek* Fountains, they were able to extract Light out of the Darkness of the *Arabic* Version. This indeed would have been impracticable, if the Demonstrations had not been obvious and easily comprehended by them, as they were, by being universally practised by the Learned in the Arts. Yet this very Work did *Regiomontanus* revise and perfect at *Rome*, when he had learned *Greek* and conferred with *Theon*. There is still extant an Epistle of *Regiomontanus*, full of Piety, wherein he laments the Death of his Master *Purbachius*, and so extols his Ingenuity, as to prefer him to all the Mathematicians of that Age.

But both *Purbachius* and *Regiomontanus* were equally desirous of visiting *Italy*, as well to converse with learned Men, as to study the *Greek* Tongue, in which they knew were contained the Fountains of those Arts, and enable them to understand *Ptolemy*, speaking in his own Language; to which *Bessarion* advised them, and entreated they would bear him Company. *Regiomontanus* tells us, that he, being then very young, seeing two very ingenious Men, *Purbachius* and *Franciscus Mantuanus*, much

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perplexed in understanding the Version of *Ptolemy*, on Account of their Ignorance of the *Greek* Language, was greatly concerned that he could not inspect those Fountains, nor could have any Masters to instruct him in that Language, and therefore determined, at some convenient Time, to go to *Italy*. But the immature Death of *Purbachius* prevented his Design of undertaking this Journey; and the Grief of *Regiomontanus*, on this Occasion, was so great, that he quitted *Vienna* without any Regret.

He therefore accompanied *Bessarion* in his Return to *Italy*, being then near thirty Years of Age. At *Rome*, he often conversed with *Trapezuntius*, and viewed the Libraries, which increased his Earnestness to labour at the *Greek* Tongue. Warm with that Desire, he described many Things with his own Hand, and by an assiduous Perusal of *Ptolemy's* Book, they became familiar to him. Then it was he wrote his Dialogue against the Theories of *Cremonensis*. A little while after, he went to *Ferrara*, where then were *Blanchinus*, *Theodorus Gaza*, and *Guarinus*, who taught *Greek* there. Here, for upwards of a Year, he laboured with all his Might to make himself perfect in that Language, and made such Progress therein, that he wrote Verses in *Greek*, which are still extant, and could readily converse with the *Grecian* Philosophers. Here he likewise began to compare *Ptolemy* and the Commentaries of *Theon*. Departing, not long after, from *Ferrara*, he came to the Academy at *Padua*; where, at the Request of the Students in Philosophy, he publicly pronounced his *Alfraganus*; the Preface to which is yet extant; in which he not only harangues on the Discipline, but celebrates, with great Candour, the Mathematicians who were then famous in *Italy*, and who were his Friends, as well for the Sake of Virtue, as the Fellowship of their common Studies.

Regiomontanus having finished his *Alfraganus*, about the Time that *Bessarion* returned from *Greece*, in the Year 1466, repairs to *Venice*. Here he wrote, with great Accuracy, his Treatise of *Triangles*, and a Refutation of the Quadrature of the Circle, which was thought *Cardinal Cusan* had demonstrated. After which he came back to *Rome*, where he made some Stay, in order to Purchase the most curious Books; those he could not buy, he took the Pains to transcribe, for he wrote with great Facility and Elegance; and others he got copied at a great Expence. For

as he was certain that none of these Books could be had in *Germany*, he thought on his Return thither, he would, at his Leisure, translate and publish some of the best of them. Meanwhile he had a fierce Contest with *Trapezuntius*, who had committed very gross Blunders in interpreting the Commentaries of *Theon*.

Having furnished himself with a sufficient Number of Books, and finding nothing more to detain him in *Italy*, he repairs to *Vienna*; where he again read Lectures in the Mathematics.

While he was thus employed, *Matthias*, King of *Hungary*, sends him an Invitation, which being accompanied with magnificent Presents, and the Promise of an annual Pension of 200 *Hungarian* Pieces of Gold, he was prevailed upon to go to him; not so much for the Sake of this Royal Munificence, as on account of the Reputation which this King had acquired by his military Virtues, but more especially for his Love of Letters; for he had bought up all the *Greek* Books that could be found in the sacking of *Constantinople*, and those that were brought from *Athens*, or wherever else he could meet with them thro' the whole *Turkish* Dominions, and collected them into a noble Library at *Buda*. In short, *Matthias* held him in the highest Esteem, frequently made him sit at his Table to hear his learned Discourses, and more than once declared, that to him he owed the Restoration of his Health. The Case was thus: The King had for some Time been extremely ill; the Physicians in vain sought for the Cause of the Disease in the Humours; and observed, that there was an unusual Languor of the Heart. *Regiomontanus* told them, that this great Imbecility of the vital Powers was caused by the || *Eclipse of the Moon*, and therefore not to be found in the Humours; and to remove it, they had no more to do, than to strengthen the Heart with comfortable, and exalting Medicines. Upon which the King recovered, and rewarded *Regiomontanus* with a rich Vest, and other noble Gifts.

But it was not only the Kindness of the King, but the Friendship of the Archbishop of *Strigonia*, who was continually heaping Largeſſes upon him, that detained him in that Country. *Regiomontanus* celebrates the Praises of this Prelate in an Epistle, in

|| This is a remarkable Instance of the Power of customary Error over the Minds of Men of the greatest Genius and Learning.

in which he dédicates to him his Tables of Directions, which he had wrote at his Instance. For he, also, was greatly delighted with judicial Astrology; to which nothing was a greater Help than Tables of Directions; yet nothing of that Kind was then extant, except the Tables of an Archdeacon of *Parma*, which were very imperfect.

At the same Time, *Matthias* made War against the *Bohemians*, which disturbed the Tranquility of many neighbouring Countries. *Regiomontanus*, to avoid the impending Storm, looked out for some other Place to settle in, where he might pursue his Studies, and resolved to retire to *Norimbergh*. Having for this Purpose obtained Leave of the King, and paid his last Respects to his Friend the Archbishop, to this City he goes, in the Year 1471. He himself tells us the Reasons which induced him to reside in this City the Remainder of his Life; namely, that the Artists there were dextrous in fabricating his Astronomical Machines; moreover, he could, from thence, easily transmit his Letters by the Merchants into foreign Countries. Being now well versed in all Parts of Learning, and having thoroughly examined the Opinions of others, and had made as great a Proficiency in the Mathematics as he possibly could, he determined to publish the best of the antient Writers, as well as his own Lucubrations. For this Purpose he set up a Printing-house, and proposes a Nomenclature of the Books he intended to publish, which still remains.

Here that excellent Man, *Bernardus Waltherus*, one of the principal Citizens, in the Prime of his Age, rich, skilled in the Sciences; especially Astronomy, cultivated an Intimacy with him; and, as soon as he understood his double Design, took upon himself the Expence of constructing the Astronomical Instruments, and erecting a Printing-house. First he ordered Astronomical Rules to be made of Tin, for observing the Altitudes of the Sun, as likewise of the Moon, and the rest of the Planets, but especially of the Sun. In the next Place, he constructed a Rectangular, or Astronomical Radius, for taking the Distances of those Planets. Then an Armillary Astrolabe, such as was used by *Ptolemy*, and, before him, by *Hipparchus*, for observing the Places and Motions of the Stars. Lastly, he made other lesser Instruments, as the Torquet, such

as *Regiomontanus* had described for the Use of the Archbishop of *Strigonia*; also *Ptolemy's* Meteoroscope, such as he had formerly shewn to *Bessarion*; and some others which had more of Curiosity than Utility in them. In these Works they were employed till the Beginning of the following Year.

From this Astronomical Apparatus, it evidently appears, that *Regiomontanus* was a most assiduous Observer of the Laws and Motions of the celestial Bodies. It will not, I imagine, be disagreeable to the Reader, to give one Instance of his Accuracy and Exactness in the Observation he made on the Progress of a Comet that appeared in his Time.

In the Beginning of the Year 1472, a Comet was discovered on the Ides of *January*, and continued to the End of *February*. The Motions of this famous Comet, *Regiomontanus* has given us in the following Terms. “ This Comet, says he, was seen by us under *Libra*, with the Stars of *Virgo*. The Head of it had a slow Motion, ’till it was near the *Spica*. It proceeded thro’ the Legs of the *Bull*, towards the Left, from whence descending, in one natural Day it described the Portion of a great Circle of forty Degrees, where being in the Middle of *Cancer*, its greatest Distance from the Orb of the Signs was seventy-seven Degrees. Then it went between the two Poles of the Zodiac, and of the Equinoctial, ’till it came between the Feet of *Cepheus*. Then thro’ the Breast of *Cassiopeia*, over the Belly of *Andromeda*. After going the Length of the *Northern Fish*, where its Motion was greatly retarded, it approached the Zodiac, passing it near the Middle of *Aries*, and coming up with the Star of *Cetus*, it was hid from us by the Sun-beams, at the latter End of *February*. By this, its proper Motion, it described a Portion of the Great Circle, by which it was carried into the North, and against the Succession of the Signs, from *Libra* to *Aries*. In the End, and in the Beginning it moved slowly; in the Middle of its Appearance very swiftly, in one Day, almost thro’ four Signs, from the End of *Virgo*, to the Beginning of *Gemini*. And according to its natural Tendency, ought to have continued its Motion, ’till it appeared again in *Libra*. And perhaps such was its Motion; because in its Setting, there was still a great Quantity of it; yet because of its Figure, in regard to the Sun, and especially in the Regions of the North, it could scarce be seen in the End of its

Appearance, unless towards the Meridian in *April*, tho' it should have preserved the Regularity of its Motion. Its Tail, which was less moveable, by continually bearing towards the Stars of *Gemini*, turned round them, never deviating from them thro' the whole Time of its Appearance; and, therefore, in its first Emerfion to the West, it stretched it out, because the Stars of *Gemini* were thought to be there. But in the End, the Comet being placed under *Aries*, did not appear, except in the West, because of the Vicinity of the Sun; and with its Tail stretched towards the East, because in this Position the Stars of *Gemini* were situated. But, in the Middle of its Appearance, it turned its Tail to the Meridian; then the Stars of *Gemini* were there; and it happened the same Night, that immediately after the Setting of the Sun, the Tail looked towards the East; about the Middle of the Night, it faced the Meridian; after Midnight, the West; and before Sun-rising, it pointed to the North. This Diversity, in the Situation of the Tail, arose from its diurnal Motion, which necessarily proceeds from the *Primum Mobile*, from East to West. But tho' the Extremity of the Tail, in its proper Motion, proceeded more slowly than the Head of the Comet; yet it always moved towards the West, contrary to the Succession of the Signs, describing a Parallel from the Beginning of *Libra*, 'till it came to the Middle of *Taurus*, passing under the Feet of the *Wolf*, thro' the *Great Bear*, approaching *Perseus*, thro' which it went round the *Pleiades*, to the Tail of *Aries*, 'till it came almost in the Middle of *Taurus*. Hence it is plain, that the Head as well as the Tail of the Comet, went towards the West, never towards the East, and that not only by a diurnal, but by a proper Motion."

With regard to his Printing-house, which was the other Part of his Design in settling at *Norimbergh*, as soon as he had compleated it, he put to Press two foreign Books, and two Volumes of his own Works. The foreign Ones were, the *New Theories* of his Master *Purbachius*, and the *Astronomics* of *Manilius*. His own were, the *New Calendar*; "In which (as he says in the Index of the Books which he intended to publish) are disclosed the true Conjunctions and Oppositions of the Luminaries; also, their Eclipses delineated; the true Places of the Luminaries every Day; the Difference of the Hours, as equinoctial as

temporal; and many other Things, the Knowledge of which is very delightful." His other Work was, his *Ephimerides*, of which he thus speaks in the said Index: "The *Ephimerides*, which they vulgarly call an *Almanack*, for 30 Years: Where you may every Day see the true Motion of all the Planets, of the Head of the Lunar *Dragon*, together with the Aspects of the Moon to the Sun and Planets, and the Hours of those Aspects noted; lastly, the Eclipses of the Luminaries (if any should hereafter happen) are described in their Places; and in the Fronts of the Pages are marked the Latitudes." And so acceptable was this Work at that Time, that every Copy was sold for 12 *Hungarian* Pieces of Gold, and, indeed, were eagerly bought up by Persons of all Nations. No *Italian*, *Frenchman*, *Briton*, *Pannonian*, *Sarmatian*, or *German*, had ever seen such a Calendar. He published, likewise, most acute Commentaries on *Ptolemy's Great Syntax*, or *Almagest*: A Work, which Cardinal *Bessarion* so highly valued, that he did not scruple to esteem it worth a whole Province.

Great were the Designs of *Regiomontanus*. He prepared new Versions of *Ptolemy's Cosmography*; and, at his Leisure-hours, examined and explained Works of another Nature. He enquired how high the Vapours are carried above the Earth; and, with admirable Sagacity, discovered, that they were not above 12 *German Miles* distant from the Horizon.

We read, that during the Years 1471, and 1472, two Comets were continually flaming; which was followed by so great a Drought, that the Sources of Rivers and Fountains were dried up; with many other Calamities, Conflagrations, and Wars, that happened at the same Time. *Regiomontanus* considering, that Comets were seldom seen burning for two Years successively, and being greatly affected with the prodigious Event that followed, published his Treatise concerning the *true Place and Magnitude of Comets*.

At that Time, *M. Christianus*, a Man extremely well versed in this Sort of Learning, lived at *Erfurth*; how much he was valued by *Regiomontanus* appears from his Epistle, in which he writes, "That intending to publish Editions of useful Writers, he the more willingly came to *Norimbergh*, that he might be the nearer to him, whose Assistance, Judgment, and Censure he earnestly

The LIFE of REGIOMONTANUS. 155

earnestly desired in many Things.” Certainly, the Candour of this most excellent Artist deserves the highest Praise, since he neither envied nor defamed the Professors of his own Art.

Ramus, in the Account he gives of the admirable Works attempted and performed by *Regiomontanus*, tells us, that in his Work-shop at *Norimbergh*, was an *Automaton* in perpetual Motion; that he made an artificial Fly, which taking its Flight from his Hand, would fly round the Room, and at last, as if weary, would return to his Master’s Hand; that he fabricated an Eagle, which, on the Emperor’s Approach to the City, he sent out, high in the Air, a great Way to meet him, and that it kept him Company to the Gate of the City. Let us no more wonder, adds *Ramus*, at the Dove of *Archytas*, since *Norimbergh* can shew a Fly, and an Eagle, armed with Geometrical Wings. Therefore, those famous Artificers, who were formerly in *Greece*, and *Ægypt*, are no longer of any Account, since *Norimbergh* can boast of her *Regiomontanuses*. For the Senate and People of this City, did all in their Power to have a continual Succession of *Regiomontanuses*. For *Wernerus* first, and then the *Schoneri*, Father and Son, afterwards, revived the Spirit of *Regiomontanus*.

Some Years had passed since *Regiomontanus* was at *Rome*, where he had left such rare Specimens of his admirable Erudition, that his Name was highly venerated; but his Fame had been greatly increased by his *Ephimerides*; insomuch, that the learned Men in that City were very desirous of having his Company again. Pope *Sixtus IV.* wrote to him, inviting him to come; for having resolved to set about a Reformation of the Calendar, and finding No-body at *Rome* equal to the Work, desired his Assistance. Great Promises were made him, and as a farther Inducement, he was created Bishop of *Ratisbon*.

Regiomontanus was some Time in Suspence, before he could prevail with himself to accept the Invitation. The Splendor of the Dignity offered him was very noble; but much dearer to him were the Delights of his Studies, which a just Discharge of the Duties of the pastoral Office, must necessarily interrupt. He likewise considered, that he should leave the Edition of so many valuable Authors imperfect, and which he had so much at Heart, that he could not easily be drawn from it. Neither should he find at *Rome*, that excellent Patron, Cardinal *Bessarion*, who,
about

about three Years before, died at *Ravenna*. For these Reasons, it was with great Regret he undertook the Journey, presaging, it is said, his own Death; but the Pope's Authority prevailed. Another Motive was, the Cause proposed, which would gratify his Desire of being serviceable to the Public. For every one knows of what Consequence it is, to have the Course of the Year rightly ordered and correct; and he would not withhold his Hand from so great, and useful a Work.

To *Rome*, therefore, he went, where he had not been quite a Year, before he departed this Life, about the End of *July*, in the Year 1476; not without a strong Suspicion of being poisoned by the Sons of *Trapezuntius*, because he had censured their Father's Version of *Ptolemy*, refuted the Errors in the Commentary, and his Reprehensions of *Theon*. He lived to the Age of forty Years, and one Month; and as it was Matter of Astonishment, that he could undertake so many, and such prodigious Works in so short a Space of Time; so his Death was attended with an universal Lamentation, for so great, and good a Man. He was buried in the *Pantheon*; and among other Verses to the Honour of his Memory, *Latomus* wrote the following.

*When Jove beheld the shining Spheres increas'd,
And a bright Tenth* just added to the rest,
Began to dread his Palace wou'd be seen,
Naked, and open to the View of Men.*

In

* The Reason of his alluding to the tenth Sphere is this: *Regiomontanus*, writing against *Thebit*, explains the Trepidation; upon which, a ninth Sphere was invented; for the simple Motion of the eighth Sphere towards its Rising, being restored, the Ninth would render that unequal, and the Tenth would vary the Obliquity of the Ecliptic; and as by that Means the *Primum Mobile* would be carried farther, there was formed a System of the whole eleven Spheres. So that it was not so much a tenth, as an eleventh Sphere which he induced; which gave Occasion not only to the Remark in the above Verses, but likewise to that Eulogy which *Jovius* bestows on *Regiomontanus*. "This one Man, says he, whom we honour for his admirable Industry, the Quickness of his Wit, and as the most excellent of all Astronomers, that ever flourished before him, invented the *eleventh Sphere* of the whole celestial Globe, the rest included in its daily Motion, with an unerring Certainty to himself, and to Posterity: In this glorious Palm of Wisdom, he was, in Truth, more noble than *Thales*, *Eudoxus*, *Callippus*, or even *Ptolemy* himself, that great Master of Science."

*In vain, said he, we mov'd that Race from hence,
Since these high Battlements are no Defence.*

Can none of us these bold Attempts oppose?

Or shall we sit content, invaded thus?

In vain, said Hermes, you the Fates defy;

'Tis their Decree, this Man shall never die.

If you'd restrain him, I advise you thus——

This Instant canonize him one of us.

P O S T S C R I P T.

PURBACHIUS, who has been often mentioned in the foregoing Life, was not only the Master, but the Associate of *Regiomontanus* in all their arduous Labours after Knowledge in the Sciences. They equally endeavoured to improve every Branch of Learning, by all the Means in their Power, tho' Astronomy seems to have been the favourite Study of both. What Advances *Regiomontanus* made in that celestial Science, we have already seen; and had not the immature Death of *Purbachius* prevented his further Pursuits, there is no Doubt, but that, by their joint Industry, Astronomy would have been carried to the greatest Perfection. That this is not merely Surmise may be learnt from those Improvements which *Purbachius* actually made, to render the Study of it more easy and practicable. His first Essay was, to amend the *Latin* Translation of *Ptolemy's Almagest*, which had been made from the *Arabic* Version; this he did, not by the Help of the *Greek* Text (for he was unacquainted with that Language) but by drawing the most probable Conjectures from a strict Attention to the Author's Sense. He then proceeded to other Works, and wrote a Tract, which he entitled, *An Introduction to Arithmetic*; then a Treatise on *Gnomonics*, or Dialling, with Tables suited to the Difference of Climates; likewise a small Tract concerning the Altitudes of the Sun, with a Table; also, *Astrolabic* Canons, with a Table of the Parallels, proportioned to every Degree of the Equinoctial. After that, he constructed solid Spheres, or celestial Globes, and composed a new Table of fixed Stars, adding the Longitude, by which every Star from *Ptolemy* to the Middle of that Age had increased. He likewise invented various other Instruments;

among which was the *Gnomon*, or geometrical Quadrate, with Canons, and a Table for the Use of it.

But farther; he not only collected the various Tables of the *primum Mobile*, but added new ones, and invented a new Table of Sines, which proceeded by ten Minutes (*Minuta Deha*) the whole Sine being supposed to consist of 6000000 of Parts; which *Regiomontanus* afterwards extended to single Minutes. *Purbachius* prefaced it with a Tract concerning Sines, and inscribed with Chords, or parallel Lines; which though but short, yet was the first that gave Occasion gradually to introduce the Ratio of Trigonometrical Calculation.

When he had prepared the Tables of the fixed Stars, he set himself to reform the Tables of the Planets, and constructed some entirely new for Equations; because in the *Alphonfine* Work they were too inaccurately drawn. Having finished his Tables, he wrote a Kind of perpetual Almanac, but chiefly for the Moon, agreeing to the Periods of *Meton* and *Callippus*; likewise an Almanac for all the Planets, or, as *Regiomontanus* afterwards called it, an *Ephemeris*, for many Years. But observing there were other Planets in the Heavens at a great Distance from the Places where they were described to be in the Tables, particularly the Sun and Moon (whose Eclipses were observed by all, and yet frequently not happening according to the Times foretold) he applied himself to construct new Tables, particularly adapted to Eclipses; which were famous afterwards, as none ever equalled them for Exactness. To the same Time may be referred his finishing that famous Work, entitled, *A new Theory of the Planets*, which *Regiomontanus*, after his Death, published the first of all his Works.

HENRY CORNELIUS AGRIPPA.

HENRY CORNELIUS AGRIPPA was born at Cologne, in Germany, on the 17th Day of September, in the Year 1486. He was a Descendant of that truly noble and ancient Family, called the *Nettesheims*; and being very ambitious of treading in the Footsteps of his renowned Ancestors (who had
for

For many Years possessed some of the most honourable and important Posts that the several Princes of the House of *Austria* could confer upon them;) he entered himself, even during his Minority, into the Service of the Emperor *Maximilian*, who soon took Notice of him; for, as from his tender Years he had applied himself remarkably close to the Study of the Languages, and had made himself, before his Arrival at ten Years of Age, a perfect Master of *Penmanship*, in all the various *Branches* of it, then principally practised in his native Country, he was soon advanced to a very considerable and advantageous *Clerkship* under the Government; but having still more extensive Views, and a Taste for the Sword, he voluntarily laid down that sedentary Life, in order to serve his Country in the Army; and for seven Years successively, he acted as a Volunteer amongst the Imperial Forces that were then employed in *Italy*; where, in divers Engagements, he so far distinguished himself by his Intrepidity and good Conduct, that, as a Compensation in some Measure for his extraordinary Merit, he was highly honoured, and distinguished by the Title of *Knight of the military Order*. However, notwithstanding this Preferment, he was as fond of shining in the literary World, as in the Field; and for that Reason, took up his Degrees in the University, and assumed the public Character, not only of a *Doctor of Laws*, but that of *Physic* likewise; in both which he was an able and experienced Practitioner.

It is allowed by all who had the Honour and Pleasure of being personally acquainted with him, that he was a Gentleman of an incomparable Genius, and profound Penetration; that he was perfect Master of Eight several Languages, and well versed in the Knowledge of most of the Arts and Sciences; insomuch that, *Paulus Jovius* calls him a *portentous Wit*; and *Ludovicus Vives* styles him the *Miracle* of the Age he lived in, and assures us, that of those Few that were learned in that dark Age, he by far excelled them all. He was, in short, such an Adept in the Secrets of Nature and Art, that the illiterate Vulgar looked on him as a dangerous Person, and as one that had some illicit Communications with the Devil.

It must be acknowledged, however, that, though he was the Admiration of *Trithemius*, *Erasmus*, and *Melancton*, and some others, who, in that Age, were shining Lights, and sincere Lo-

vers of Learning, yet, through his over-curious Enquiries, and the too great Liberties which he took of disclosing his Sentiments; particularly his interfering too far in Points relating to the Church, he exposed himself to the high Displeasure of the Clergy.

By several of his Letters it appears, that he resided for some Time in *France* before the Year 1507; that he travelled into *Spain*, in the Year 1508, and that he read public Lectures at *Dola*, in the Year 1509; where, though some of the *Monks* looked upon many of his Tenets as heterodox and dangerous; yet he was so far admired by others, even by those of the highest Rank and Quality, that they honoured him with their Attendance.

And in order to ingratiate himself with the Lady *Margaretta* of *Austria*, who was then *Governante* of the *Netherlands*, he signally distinguished himself as an *Advocate* for the *Fair Sex*; and published a Treatise accordingly, wherein he endeavoured to demonstrate, that, in Point of Excellency, the *Gentlemen* were by far inferior to the *Ladies*. In which the Sentiments he expressed were correspondent with his Conduct; for he was twice married, had many Children by each of his Wives, and was lavish in their Praises at their Decease.

From *Dola*, in the Year 1510, he travelled to *England*, where he published his *Commentaries* on the *Epistles* of *St. Paul*.

Some Time after, he went back again to *Cologne*, where for several Months, he read Lectures of Divinity in Public, and then returned to the Emperor's Army in *Italy*; where he tarried till the Cardinal *de St. Croix* invited him to *Pisa*, where he would undoubtedly have shone amongst the Doctors of the Council, had that Assembly continued their Sessions. After that, he read several Divinity Lectures publicly both at *Pavia* and *Turin*.

His Lectures at the former were in 1515; and besides those of Divinity, he read one as an Apology for, or rather an Encomium on *Mercurius Trismegistus*, otherwise called *Hermes*, a Philosopher of great Reputation, who was generally allowed to be the first Naturalist that ever applied himself to the Study of the *Philosopher's Stone*.

By his great Merit he had a Post, of considerable Profit and Reputation, conferred on him at *Metz*; but for espousing the Cause of a young Country Lass, who was charged with Witchcraft, he

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was obliged, not only to resign his Place, but to abandon the City.

In the Year 1520, he repaired to *Cologne*, the Place of his Nativity, as before observed; but in the Year ensuing, he went to *Geneva*, and from thence to *Fribourg*, where he acted publicly as a Physician; and in 1524, he went to *Lyons*, and there made himself so conspicuous, as to be appointed Physician in Ordinary to the Dutcheſs of *Savoy*, Mother to *Francis I.* King of *France*; but he is ſaid to be diſmiſſed from that honourable Service, thro' his Non-compliance with his Miſtreſs's Orders to find out, by the unerring Rules of *Aſtrology*, the true State of the Nation; and thro' an honeſt Freedom which he took in aſſuring her, that her Curioſity was vain and fruitleſs; and adviſing her, at the ſame Time, to apply her Mind to Matters of more real Importance.

Agrippa, being thereupon immediately diſcarded, indulged for ſome Time his Reſentment, and wrote ſeveral ſevere Invectives againſt her, as well as thoſe who were the principal Inſtruments of his Diſgrace; but, upon more mature Deliberation, he determined to retire to the *Netherlands*, and having procured a Paſſport for that Purpoſe, he arrived at *Antwerp* in *July* 1528, where he ſoon became eminent; and in 1529, was invited, at one and the ſame Time, to the Service of King *Henry* of *England*, of the Emperor *Charles V.* and to that of the Dutcheſs of *Auſtria*, in Compliment to whom he compoſed his *Vindication* of the *Fair Sex*, as before-mentioned.

He accepted the latter, and was conſtituted, thro' her Means, Hiſtoriographer to his Imperial Majeſty.

He publiſhed, by Way of Introduction, the Hiſtory of the Coronation of *Charles V.* and ſoon after, he was appointed to draw up, and pronounce in Public a *Dirge*, or *Funeral Eulogium*, on his Patroness the *Governante*, then lately deceased, whoſe Death proved, in a great Measure, (if we may be indulged the Expreſſion) the *Life* of our *Agrippa*; for his Enemies had endeavoured greatly, to leſſen his Reputation with the Emperor.

Being greatly chagrined, thro' the ill Treatment that he had met with at Court; he ſoon after publiſhed his Treatiſe on the Vanity and Imperfection of all the Arts and Sciences in general; which was penned with remarkable Keenneſs; wherein he en-

deavoured to demonstrate, that they rather tended to the Corruption of Mens Manners, than to their Reformation; and it is highly probable, that the satyrical Reflections that are plentifully interspersed throughout that Work gave great Disgust to his Adversaries, and were the principal Means of its not meeting with that Success, which it really deserved.

Tho' the preceding Dissertation gave his Enemies great Disgust; yet another, which he published soon after at *Antwerp*, entituled, *The Occult Philosopher; or, a new Display of the Secrets of Magic*, proved still more offensive than the former, and provoked them beyond all Measure. Cardinal *Campegio*, it is true, the Pope's Legate, and the Cardinal *de la Marc*, then Bishop of *Liege*, were his sincere Friends, and used their utmost Endeavours to silence his outrageous Opponents; but their Interest proved of very little real Service; for with all their good Offices, neither of them could recover for him One single Penny of his Pension, as Historiographer in Ordinary to *Francis I.* then King of *France*; or as domestic Physician to the illustrious Lady *Margaretta*, his Majesty's Mother, then *Governante* of the *Netherlands*; neither were they able, in short, to prevent his Imprisonment at *Brussels*, in the Year 1531. All their Services amounted to no more than this; namely, the Accomplishment of his Discharge soon afterwards.

In 1532, indeed, he paid a Visit to the Archbishop of *Cologne*, to whom he dedicated his last mentioned *Occult, Magical Treatise*, and received from his Grace a complimentary Letter on the Occasion, with his free Permission to publish it under the Shelter of his Patronage and Protection. The Dread of his Creditors, who were at that Time too numerous, and too highly exasperated at his Conduct, obliged him to take up his Residence at *Cologne* somewhat longer than he intended: However, he very openly and warmly opposed the literary Censors of the Place, who used their utmost Endeavours to suppress the Publication of a *New Edition* of the last-mentioned Philosophical Treatise, which was then in the Press, and had been carefully revised; with very considerable Additions and Amendments. This *New Edition*, however, notwithstanding all the powerful Opposition it met with, made its public Appearance, in the Year 1533.

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After he had conquered this arduous Undertaking, he withdrew to *Bonn*, where he resided till the Year 1535.

Fond of roving about, he there determined to revisit *Lyons*; and went accordingly; but, before he was well settled, he was taken into Custody by a *French* Messenger of State, for having wrote a severe Satyre on his late Patroness, the Mother of King *Francis I.* who had discarded him, as her Physician in Ordinary, without the least Fee or Reward. Thro' the Interest of some of his Friends at Court, however, he was soon restored to his Liberty; whereupon, he immediately retired to *Grenoble*, and departed this Life there before the Expiration of the Year 1535.

Some say, he died in one of their public Hospitals; some again say, at the House of the Receiver-General of the Province of *Dauphiny*; but others insist, that he breathed his last, at an Abbot's Apartment, and was decently interred in the *Jacobine* Convent.

But be that as it will, it is manifest, that he was no richer in his latter Days, than he had ever been before. For, *Don Quixot* like, he was for ever wandering about, and hunting after new Adventures; had ever in his Eye some distant Prospects of the last Importance; was always very unsuccessful; and, in a Word, too often reduced to the very lowest Ebb of Fortune, even to the Want of the common Necessaries of Life.

This is too often the Case, and the hard Lot of most of the Virtuosi, and Men of real Merit, who, regardless of the Frowns of that capricious Mistress, run indiscreetly the Risque of being utterly ruined and undone, in their eager Researches after new literary Acquisitions: Acquisitions, indeed, which are inestimable to those who have a true Taste for them; but seldom, very seldom, if ever, put it in their Power, to live independent, and to look down with an Eye of Contempt of such worthless Mortals, who value themselves, tho' without one Grain of Wisdom, in Proportion to their Riches; and make Merit in Rags the daily Objects of their Ridicule.

But to return to our Memoirs. It is highly probable, that he lived and died in the Communion of the Church of *Rome*; notwithstanding it is well known, that he was too partially fond of the Doctrines of *Luther*, and his Disciples. There never appeared, as we have heard, any Treatise of *Agrippa's* in Public, wherein

wherein he countenances the arbitrary Divorce of *Henry VIII.* from his lawful Queen.

As to his Practice of the *Black Art*, as well as that of *Physic*, our Historians are not perfectly agreed. And much may be said on both Sides of the Question. But, in short, if ever he did publicly profess himself to be a Magician; he demonstrated, beyond all Contradiction, the Weakness of his Art; for never did any *Adept* in *Occult Philosophy* miscarry oftener than he did; nor was any unfortunate Virtuoso ever reduced so often as he, to the Want of a Morsel of Bread for his Subsistence.

To conclude; the Financiers, or Receivers-General of the Revenues of King *Francis I.* and those of *Charles V.* were fully convinced of his Innocence, in that Particular, and never looked upon him as a Conjuror; for had they entertained the least Notion of him as such, they would never have attempted to baffle him, in the shameful Manner that they always did, whenever he formally petitioned for the Arrears of his Pension.

The Substance of this Life was principally extracted from an anonymous *French* Author, who, it is plain, was not fully convinced of the Nullity of the *Magic Art*, than which, a more gross and blasphemous Imposture never infested Mankind.

The LIFE of COPERNICUS.

NICHOLAS COPERNICUS was a Native of *Thorn*, a City of Note in *Prussia Royal*, where he was born *January* 19, 1473. His Father's Name was *Nicholas*, and his Mother was Sister to *Lucas Watzelrode*, afterwards Bishop of *Warmia*. He learnt the *Latin* and *Greek* Languages partly at Home, and partly at the University of *Cracow*, where he studied Philosophy, and sometimes Medicine; at length he obtained the Degree of Doctor. Mean while, as he was always extreamly fond of the Mathematics, he attended the Lectures, private and public, of *Albertus Brudzevius*, a Professor of that Science in the same University. Of him he learnt the Use of the Astrolabe, by which he got a good Insight into Astronomy, and at length grew so emulous of the illustrious Fame of *Regiomontanus*, that he resol-

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The LIFE of COPERNICUS. 165

ved to follow him in all his Steps. Among his Fellow-Students, who were equally ambitious of acquiring Fame in the same Way, was *Jacobus Coblinius*, who afterwards published an Explanation of the Astrolabe; also *Vapovius*, *Nicolaus*, *Schadekius*, and *Martinus Ilkufius*, with whom he frequently conferred on the Observations they made on Eclipses. He, however, cultivated every Part of the Mathematics, but applied himself more especially to Perspective, by which Means he became so complete a Master in Painting, that he drew his own Picture, with a surprising Likeness, before a Glass. His View in learning to paint was, that, in his Travels, especially thro' *Italy*, he might be enabled, not only to copy, but delineate with his own Pencil whatever was worthy his Observation.

Being returned to *Thorn*, after a short Stay, he set out for *Italy*, being then in the 23d Year of his Age. He stopped first at *Bononia*, to give himself the Pleasure of conversing with *Dominicus Maria*, a Man of excellent Erudition, and who for twelve Years had taught Astronomy with great Applause. From thence he proceeded to *Rome*, where, in a short Time, his Fame was little inferior to that of *Regiomontanus*. Here, in a full Assembly of Doctors and great Men, he was instituted Professor of the Mathematicks.

After some Years spent at *Rome*, he returned to his own Country, where, on account of his high Attainments in Learning, and the Gentleness of his Manners, he was affectionately received by his Uncle, *Lucas Watzelrode*, Bishop of *Warmia*; who, in order to give him the more Leisure to pursue his mathematical Studies, settled him in the College of Canons at *Warmia*, appertaining to his Cathedral Church. However, he was not suffered at first to enjoy his Canonate in Peace, as he often complains in his Letters to his Uncle, who remained at Court, that he might be at Hand to defend the public Cause against the Cross-bearers and *Teutonic* Knights; which so provoked them, that they libelled him publicly in the Dyet of *Posnania*. But at length, his own Merit, together with that of his Uncle, prevailed, and he obtained a peaceable Possession. Upon which he instantly applied himself to three Things in particular. One was, diligently to attend on divine Offices: Another, to attain so much Skill in Medicine, as to enable him to relieve the Poor

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whenever they should want his Assistance ; thirdly, to employ the Residue of his Time in Study. For which Purpose he always chose Solitude ; and, except the Affairs of the See, or the Chapter required it, never, but with Reluctance, engaged in Business. But as this was sometimes unavoidable, such was his Sagacity, and the Solidity of his Judgment, that his Opinion was generally acquiesced in. For Instance ; when the Assembly of the States was held at *Grodno*, he was unanimously chosen by the College of Canons to represent them there. Among other Affairs transacted in that Dyet, one was concerning Money, the Value of which had been very much diminished by the late Wars. A Committee of *Prussian* and *Polonian* Senators were appointed to examine the Matter. They accordingly deliberated frequently upon it, but could come to no Resolution, and broke up without settling any Thing. Upon which, *Copernicus* drew up a Canon, or Rule, for computing all Sorts of Money then current through all the Provinces of the Kingdom, and for reducing them to a certain Standard ; with which the Senate were so well satisfied, that they caused it to be inserted among their public Acts.

But as he never sought Occasion to engage in Business, so he never declined it when fairly offered. But our principal Regard will be to that Part of his Life, which he devoted to Contemplation and Study ; and as he affected nothing so much as the Knowledge of the Heavens and Celestial Bodies, for which his Name is so highly celebrated, we shall relate in what Order he began, and by what Steps he proceeded to those Attainments he acquired in this Science.

In the first Place, he observed, that Astronomers, while they would maintain an equal Motion in the celestial Circumvolutions, took for it, or measured from, not a proper, but a wrong Center ; namely, that of a Circle called the Equant. Nor could they collect the principal Thing, that is, the Form of the World, and its fine Disposition, from that Heap of Hypotheses which they were forced to use. Wherefore he resolved to peruse as many of the Books of Philosophers and Astronomers as he could lay Hands on, examine their several Systems, and search out what was probable in them, that, from the Whole, he might form a more exquisite Harmony of the celestial Motions, and

and Symmetry of the Parts of the World, than that which had been universally admitted.

As he knew that the *Pythagoreans* had removed the Earth from the Center, and had placed therein the Sun, the most noble of all Bodies, he imagined he perceived somewhat of a beautiful Order, if he might only be allowed to make a Change, that is, to place the Sun in the Center, and make the Earth move round the Sun. For *Nicetas*, *Echphantus*, *Heraclides*, and others; aimed well, who, though they detained the Earth in the Center, yet gave it a Motion, by which it turned on its own Axis, like a Sphere in a Wheel, and daily perfecting a Circuit from the West to the East, made the Vicissitude of Day and Night, and assuming the Office of the *Primum Mobile*, discharged the Sphere of the fixed Stars, and all the Planets from their rapid Motion; so that the Earth being turned to the East, all the Stars must necessarily appear turned to the West, which nevertheless would appear very disproportionate. Wherefore *Philolaus* did much better, when, removing the Earth from the Center, he gave it not only a diurnal Motion round its own Axis, but an annual Circuit round the Sun; by which Means it happens, that in traversing the Zodiac, under whatever Sign it is, the Sun appears in opposition; so that the Earth itself, *Mercury*, *Venus*, and the rest of the Planets, must acknowledge the Sun as their Center. But it seemed absurd to pluck the Earth from the Center, and to give it such Kind of Motions. *Copernicus*, therefore, having variously canvassed the Matter, and ascribed a triple Motion to the Earth, he thus writes: “ By
“ a close and long Observation, I have at length found, that
“ if the Motions of the rest of the Planets be compared with
“ the Circulation of the Earth, and be computed for the
“ Revolution of each, not only their Phenomena will follow,
“ but it will so connect the Orders and Magnitudes of the
“ Planets, and all the Orbs, and even Heaven itself, that No-
“ thing in any Part of it could be transposed, without the Con-
“ fusion of the Rest of the Parts, and of the whole Uni-
“ verse.”

This was about the Year 1507. But he did not think it enough to establish a general Ratio of Hypothesis only, and according to it to solve Phenomena in general; but he wanted likewise

likewise to conclude upon some special Hypotheses, so as to define the Periods of all Motions, that from thence he might be able to erect Tables for the Heavens, preferable to the *Ptolemaic* and *Alphonfine*; for which Purpose, he judged it necessary to make Observations, and by comparing them with those more antient, he might attain to a greater Precision. To this End he fabricated a Quadrant, to be erected and applied to the Meridian Line above the Plane of the Horizon, that by the Help of a Shadow, from a cylindrical Gnomon fixed at the Center, might be observed the greatest and least Meridian Altitude of the Sun, in the Summer and Winter Solstice; likewise for taking the Distance of the Tropics, and the Altitude of either; also the Altitude of the Equator in the Middle; likewise the Altitude of the Pole might thereupon be known, by estimating the Altitude of the Equator. He likewise constructed a parallaetical Instrument of Fir Wood, whose Limb was divided into 1414 small Parts, or Portions, marked with Ink, to the End it might subtend the right Angle of a Quadrant, whose Legs were four Cubits long, consisting of 1000 of the same Parts. The Use of this was, for observing the Altitudes of any of the Stars, particularly of the Sun, not only when he is about the Tropics, but also about the *Æquinoctial*; but especially in the Spring, to observe his Entrance into *Aries*. Likewise of the Moon, but chiefly when she is in the northern Limit, and that Limit in *Cancer*, to find out her greatest Latitude; also of *Regulus*, or of any other remarkable fixed Star, in order to obtain its Distance from the *Æquinoctial* Point.

Being by these Instruments furnished with many curious Observations, he began to digest them in Order, and undertook a Work, which he finished, and divided into six Books, entituled, *The Revolutions of the Celestial Orbs*, which, in a geometrical Method, included the whole Science of Astronomy.

The first Book is divided into two Parts; in the latter, he handles the Doctrine of Sines, or Chords, which he judged necessary in solving Triangles, both plain and spherical: But in the former he has exhibited a general Idea, or Description of the World, agreeable to his own Hypothesis, in which Motion is attributed to the Earth. In the first Place, he teaches that

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the World is of a spherical Form, and assigns this Reason for it; because the Sphere is the most perfect of all Figures, and contains a greater Quantity of Space within it, than any other. He observes farther likewise, that fluid Bodies naturally put on the Figure of a Sphere; that the Sun, the Moon, the Planets, and all the heavenly Bodies, are of that Figure, and therefore, he concludes at once, that the Figure of the visible World must be such likewise; though he is in all this plainly mistaken; because, properly speaking, the World has no Figure at all, as it is not circumscribed, or bounded by any Limits; and what we call the Firmament is a mere *Ens Rationis*, or Idea of the Mind, and its spherical Form is easily accounted for on the Principles of Optics; as we shall hereafter see. In this Book, our Author very much insists on the spherical Figure of the Earth, and its circular Motion about the Sun. He considers the Reasons alledged by the Antients for placing the Earth immoveably in the Center of the System, and very learnedly and rationally confutes them; and having settled this Point, and plainly proved the Sun to possess the Center of the System, he then treats of the celestial Orbits, as those which the Planets describe about the Sun, and illustrates the same by a Diagram, which since this Time has been usually called the *Copernican System* of the World. He then treats of the twofold Motion of the Earth, *viz.* the diurnal Motion about its Axis, and its annual Motion about the Sun; and having dispatched the Doctrine of plain and spherical *Trigonometry*, he proceeds to

The SECOND BOOK. In this he considers the Doctrine of the Sphere, with a Description of the various Circles, great and small, that compose the same, with their various Intersections and Inclinations, one with another, in regard to the different Inhabitants of the Globe. He considers the Doctrine of right and oblique Ascensions, the Rising and Setting of the Sun and Stars, the Parts of Time, and particularly of Days and Nights; after this, he gives an Account of the Instruments made use of for observing and correcting the Places of the Stars. He then proceeds to give us a new Catalogue of the Stars, found in the several Signs and Constellations, with the Latitude, Longitude, and Magnitude of each particularly specified.

In the THIRD BOOK, he treats of the *Equinoxes*, and *Solstices*, and gives you a History of Observations, proving the Inequality and Precession of the same. He then treats of the Variation of the Obliquity of the *Ecliptic*, and shews, that it has been continually changing, and how it proceeds from the Libration of the Earth's Axis. The Quantity of this Motion is then computed and digested, in *Tables*. The Times of the *Equinoxes* are more particularly enquired into, and investigated, the Magnitude of the Solar Year, and the Difference observed in the same; and *Tables* of the equal and mean Motion of the Earth are computed for Years, Days, and sexagesimal Parts. He then accounts for the apparent Inequality of the Sun's Motion, with all the Variety observed in the same. He then treats of the various *Epochas*, or Times, from whence the ancient Astronomers began to compute the mean Motion of the Sun; and having largely considered the Nature and Anomaly of the Sun's Motion, he gives us a *Table* of the *Prosthaphæresis* or Equation; so that, the Difference between the true and mean *Anomaly* is known for every Part of the Orbit, and, consequently, when one was given, the other might be from thence known. After this, he discourses on the *Nychthemeron*, or the Nature and Difference of the natural Day of 24 Hours, which concludes this Book.

In the FOURTH BOOK, he treats of the Lunar Motions, and considers the various Hypothesis of the Antients concerning them: He corrects the Errors of their grosser Observations, and gives us a more particular and correct Account of those Motions, together with *new Tables* of the same. After this, he very particularly enquires into the various Differences and Inequalities of the Lunar Motion. He further shews how they are to be accounted for, according to the Hypothesis of *Cycles* and *Epicycles*, which in those Times they were obliged to make use of, for Want of knowing the true Theory of Gravity, of which the first Hints, however, were found in the Books of this excellent Writer. He expounds the Doctrine of the Lunar *Prosthaphæresis*, and gives us *Tables* of the same; by which the apparent Motion, or Place of the Moon, is found from the mean, or equal Motion given. He considers then the Motion of the Moon, in Latitude, of the Quantity of the Angle which
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the Moon's Orbit makes with the *Ecliptic*. After this, we have a particular Account of the Construction of his *Parallatic Instrument*, by which the *Horizontal Parallax* and Distance of the Moon from the Earth, were much more accurately determined, than had been done before. From hence too, he was able to measure the Diameter of the Moon, and of the Shadow of the Earth at the Moon's Orb: Also, he was hereby enabled to treat, in some Measure, of the Distance of the Sun, as also, of the comparative Magnitude of the Sun, the Moon, and the Earth; which, tho' very inaccurate, were still much nearer the Truth than any thing that had before this Time been advanced upon the Subject. Having insisted largely on these Subjects, he proceeds to his Observations on the apparent Diameters of the Sun and Moon, with the various Changes they underwent at different Times. After this, he considers the different Dimensions of the Shadow of the Earth, according to the *Apogee*, or *Perigee*, of the Luminaries, and illustrates the same by proper *Diagrams*. Then he insists largely on the Doctrine of *Parallaxes* of the Sun and Moon, both in Latitude and Longitude, and gives us *Tables* of the same. He then treats of the Conjunctions and Oppositions of the Sun and Moon, with regard to their mean and true Times and Places. Then the Doctrine of *Eclipses*, both of the Sun and Moon, is learnedly explained, in regard to the Manner in which they are produced, the Times in which they happen, the Quantity of Duration, and the Prognostics of the same; which closes the Fourth Book.

The FIFTH BOOK considers the planetary Motions, and their various Affections. He gives us the Number, their Distances from the Sun, and the Times of their Revolution, together with *Tables* of their mean Motions for Years, Days, Hours, and Minutes. After this, the particular Theories of each Planet are taught and illustrated by proper Figures. He then gives an Account of the Distance of those Planets from the Earth, the Apfides and Excentricities of their Orbits, the mean Motions and Anomalies, with the Times or Epochas from whence they have been computed for each Planet, with the Quantity of the same, in proper *Tables* of the *Prosthaphæsis*, peculiar to the Orbit of each; and having accounted for the

he various Appearances and Inequalities of their Motions, in regard to their direct and retrograde Motions and Stations, he puts an End to the Fifth Book.

The SIXTH BOOK is wholly spent in enquiring into, and ascertaining the Latitude of the planetary Orbits, or the Inclination which they make with the Ecliptic, their Excentricities, the Places of their Nodes, &c. and then the Whole is concluded with Tables of the Latitude of each Planet.

His Book was printed at *Norimberg*, in the Year 1543, and till then, the World had never seen any Thing that looked like a true System of Astronomy. For what *Ptolemy* had done in his *Almagestum Magnum*, was entirely upon a false Hypothesis, as we have already observed in the Life of that celebrated Author; and what had been performed by *Regiomontanus* and *Purbachius*, could be deemed no other than rude Sketches, and Outlines of the Science; and though their Writings were in great Repute, we do not find *Copernicus* made the least Use of them, since we find no Mention of their Names, or of their Writings in the Introduction to the present Work, tho' *Copernicus* wrote many Years after the *Ephemerides* of *Regiomontanus*, and the Theories of *Purbachius* were published.

It appears from the Writings of *Gassendus*, in the Life of this Author, that he finished this Work about the Year 1530; what he did afterwards, was only by Way of Correction, or Amendment of what he had before written.

About the Year 1516, he applied himself to find out and reduce to Numbers, the various Motion of the Moon, in compliance with the *Lateran* Council, in which the Reformation of the Calendar was again agitated, which had been before debated in the Councils of *Constance* and *Basil*; and on which Account *Sixtus IV.* afterwards sent for *Regiomontanus* to *Rome*, as before mentioned in his Life, p. 155. Thus it was: When the *Lateran* Fathers had appointed a Committee for this Purpose, they made *Paul* of *Middleburgh*, Bishop of *Sempronia*, their President; he, by Letters, consults *Copernicus*, and earnestly entreats him to assist them with his Skill and Knowledge in this arduous Affair; *Scultetus*, his Friend and Colleague, joined in this Request. But *Copernicus* would offer nothing precipitately, but promised all possible Diligence in investigating a Matter

The *LIFE* of COPERNICUS. 173

of such Moment. The Business therefore remained unfinished, and *Copernicus* applied himself so closely to the taking and defining the Motions of the Sun and Moon, that in the Dedication of his Work to the Pontiff, he foretels, that his Labour would not be unuseful to the Ecclesiastical State. And it is certain, that the Mathematicians, who were afterwards appointed by *Gregory XIII.* pursuant to the Decree of the Council of *Trent*, for the Emendation of the Calendar, made use of his Works; as is evident from that Chapter, to which *Christopher Clavius*, in his Explanation of the Calendar, gives the Title, *Of the Period of the Anomaly of the Equinoxes, and Inequality of the Years, according to the Doctrine of Nicholas Copernicus.* And altho' they thought, that the *Alphonsine* Form of the Year ought to be retained; yet they found that it was, as it were, the Middle between the Greatest and the Least, as *Copernicus* had observed it at divers Times to agree.

To his Honour it is remembered, that *George Joachim Rheticus*, an ingenious and learned young Man, and Teacher of the Mathematics at *Wittemberg*, struck with the Fame of *Copernicus* and his Hypothesis, quitted his Profession, went to him into *Prussia*, and professed himself his Disciple. This was in the Year 1539, with the Privacy of the famous *Schonerus*, Professor of the Mathematics, at *Norimberg*, whom he promised to inform by Letters, whether the Report he had heard was answerable to his Expectations. In about two Months, he writes to him in the following Manner: “ Believe
“ me, most learned *Schonerus*, that this Man, my Instructor,
“ in all Kinds of Learning, and in the Science of Astronomy,
“ is not inferior to *Regiomontanus*. I freely compare him to
“ *Ptolemy*; not that I think *Regiomontanus* less than *Ptolemy*,
“ but because my Preceptor has a Felicity in common with
“ *Ptolemy*, that, by the Divine Assistance, he would finish the
“ Reformation of Astronomy; whereas *Regiomontanus*, O cruel
“ Fate! died before he had erected his Pillars.”

It is further said, to the Praise of *Copernicus*, that it was not from a Love of Novelty, or to make a Display of his Wit, but from the Exigency of Things, that he travelled not in the same Road with the Antients, and particularly *Ptolemy*, whom

he highly honoured, calling him the most eminent of Mathematicians, and *Hipparchus*, a Man of wonderful Sagacity.

When *Rheticus* returned out of *Prussia*, he brought with him a Tract of *Copernicus*, concerning the *Sides and Angles of Triangles, Planes, and Spheres*, which he ordered to be printed, at *Norimberg*. This small Piece was afterwards inserted in his Work of *Revolutions*, at the End of the First Book, after the Canon of Subtenses, and is comprehended in two Chapters; the First of which is contained in seven Theorems, the Other in fifteen; to this Tract was added a Canon of Half Subtenses, or Sines, distinguished from that in the Work of the *Revolutions*; here it is supposed only at a Radius of 100,000 Parts, and proceeds by * *ten Minutes* only; but that supposes it a Radius of 10,000,000 Parts, and proceeds by single Minutes.

We shall now say something of the Publication of the Work itself, which he could hardly be prevailed upon by the earnest Entreaties of his Friends and learned Men, to permit, even in the last Days of his Life. Not that he envied Society any Benefit it might receive from his Labours; but as, on the one Hand, he never entertained any high Conceit of himself; so, on the other, he foresaw that many would be offended with the Novelty of the Thing; and therefore held it better to impart it only to his Friends, and the Lovers of Truth and Right, and, like the *Pythagoreans*, deliver it, as it were, by Hand, rather than by making it public, to raise the Clamour of the Multitude. It is certain, that when he was convinced, that the Church would be benefited by a regular Adjustment of the celestial Motions, he did not refuse to construct Tables, which might perform the Thing desired, and which afterwards came into the Hands of every Body.

Having therefore given his Assent, and put the Work in Order, he addressed it, in a Preface, to the Sovereign Pontiff; in which, he declared the Reasons which made him so reluctant to the Request of his Friends, and by what Arguments he was induced to attribute Motion to the Earth: Adding, that he did not doubt, but the ingenious and learned Mathematicians

would

would join in his Opinion, if, as this Philosophy first of all requires, they would not cursorily, but intensely apply themselves to know and consider the Arguments he had brought in this Work, for the Demonstration of these Things. He concludes in these Terms: “ But that both the Learned and Unlearned
“ may see, that I do not avoid the Judgment of any Man, I
“ have chose to dedicate these Lucubrations to your Holiness,
“ rather than to any other Person; because, even in the re-
“ motest Corner of the Earth, in which I live, you are in the
“ highest Esteem, as well for the Dignity of your Order, and
“ universal Learning, as for your Love of the Mathematics;
“ that you can, by your Authority and Judgment, easily repress
“ the Stings of Calumny, tho’, according to the Proverb,
“ there is no Remedy against the Backbiting of a Sycophant.
“ If there be some, who, tho’ ignorant of all Mathematics,
“ take upon them to judge of these, and dare to reprove this
“ Institute, because of some Place of Scripture, which they
“ have miserably warped to their Purpose, I regard them not,
“ and even despise their rash Judgment. For it is not unknown,
“ that *Lactantius*, otherwise a celebrated Writer, but an indif-
“ ferent Mathematician, speaks very foolishly of the Form of
“ the Earth, when he laughs at those who hold it has the
“ Form of a Globe. Therefore it ought not to seem strange
“ to the Studious, if, in our Turn, we laugh at such. Ma-
“ thematics are written for Mathematicians, to whom our La-
“ bours, if I am not mistaken, will seem of some Advantage
“ to the Ecclesiastical Republic, the Supremacy of which your
“ Sanctity now holds. For not long since, under *Leo X*, when
“ in the *Lateran* Council, the Question about the Emendation
“ of the Ecclesiastical Calendar was debated, but not deter-
“ mined, it remained so for this only Reason, because the
“ Magnitudes of the Years and Months, and the Motions of
“ the Sun and Moon, were not accurately measured. What I
“ have done in this Matter, I submit principally to your Ho-
“ liness, and then to the Judgment of all learned Mathemati-
“ cians. And that I may not seem to promise your Holiness
“ more concerning the Utility of this Work, than I am able
“ to perform, I pass now to the Institute itself.”

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He then put the Work into the Hands of the learned *Gysius*, and left it entirely to his Discretion. *Gysius* committed it to *Rheticus*, whose Industry, and Affection to the Author he knew. He thinking the Edition could not be better executed than at *Norimberg*, where, tho' he could not be present himself, he had some Friends eminent for their Learning, particularly *Schoenerus*, *Osiander*, and others, who would willingly undertake the Charge of it, he therefore sent it thither. *Osiander* readily undertook the Office, and not only inspected the Press, but wrote a short Preface, in relation to the Hypotheses of the Work. For he was of Opinion, that altho' *Copernicus* had ascribed Motion to the Earth, not merely as an Hypothesis, but as an undoubted Certainty; yet he thought something ought to be said by Way of Excuse, to soften the Matter to those who might be offended at it, and that he did not assert such a Motion for an established Opinion, but an Hypothesis only. "It is, says he, the Business of an Astronomer, by diligent and acute Observation, to collect the History of the celestial Motions, and when he cannot by his Reason investigate the true Causes or Hypotheses of them, to invent and contrive such, as, being supposed, those Motions might be rightly calculated, from the Principles of Geometry, as well for future, as Time past. The Artificer has excellently performed both these."

Mean while, the Edition being finished, *Rheticus* sent him a Copy of it; but, alas! The Man, who had enjoyed a perfect State of Health all his Life, was fallen into a Bloody-flux, which was soon followed by a Palsey in his Right-side; presently after, his Memory failed him, and the Vigour of his Mind was much weakened. He had, nevertheless, Strength sufficient to prepare himself for his great Change. It happened that the same Day, and a few Hours before he breathed his last, he received a Copy of his Work; but he had now other Cares upon his Mind, and composedly resigned his Soul to God, the 23d of *May*, 1543, when he was seventy Years, three Months, and five Days old. Such was the Life, and such the Death of *Copernicus*. As to his Person we can give no better Description of it, than what is contained in the following Verses, wrote by *Nicodemus Frischlinus* on his Picture.

Such

*Such did Copernicus in Life appear ;
Such was his noble Form and graceful Air ;
A ruddy Tinge his healthy Visage dyes ;
Comely his Hair, and beautiful his Eyes ;
In ev'ry Limb a just Proportion see !
A Form completely made, and such was He !
Like him, immerg'd in scrutinizing Thought ;
Earnest, like him, when he his System taught ;
The vast Circumference of Heaven scann'd,
And shew'd its glorious Orbs in Order stand ;
The sluggish Earth, as in an Orbit, whirl'd,
And Phœbus fix'd the Center of the World.*

I know not whether this Picture was like that which he drew with his own Hand, and was given to *Tycho Brabe*, who placed it in his *Museum* at *Uraniburgh*, and under-wrote the following Lines.

*Phœbus no more his bounding Coursers drives
Sublime in Air ; the Task to Earth he gives.
Amidst the World enthron'd he sits in State,
And bids the Heav'ns obey the Laws of Fate ;
Yet thro' all Nature is his Aid the same,
And changing Seasons still his Guidance claim.
Erratic Stars have now their Courses known,
By this rare System of the station'd Sun ;
They stand, go retrograde, are swift, or slow,
Just as the Earth directs them what to do.
The great Copernicus, (the Man behold !)
This heavy Orb in rapid Motion roll'd.
But why, you'll say, was not his Wit pourtray'd ?
But that is partly in the Heav'n display'd,
Partly in Earth ; for neither can confine
The boundless Searches of his daring Mind.
Again you'll say — * But Half his Figure's shewn,
A Man so worthy to be wholly known.*

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True

* This Picture was but a Half-length.

*True; yet 'tis he who bore the Earth entire
Thro' Space immense around the Solar Fire;
The spacious Earth in vain would hold the Man,
Who measures Heaven with his ample Span.*

The Life of *TYCHO BRAHE*.

T*YCHO BRAHE*, descended from a noble and illustrious Family, who were originally of *Sweden*, but afterward settled in *Denmark*, was born *December 14, 1546*, at *Knudstorp*, in the County of *Schonen*, near *Helsingbourg*. His Father's Name was *Otho Brahe*, a brave, military Officer, and his Mother's Name was *Beata*, of the antient Family of the *Billes*. His Father dying when he was young, his Mother had the Care of his Education, who endeavoured in his early Years, to train him to Knowledge and Virtue; and his filial Obedience and remarkable Improvement recommended him to the Favour of his Uncle, *George Brahe*, who, having no Children, adopted him for his Son, took him Home, and placed him under the Care of skilful Tutors, 'till he was sixteen Years of Age; he then put him to *Leipsick*, where, with the utmost Chearfulness, he entered into a Course of higher Literature; and, in a short Time, made such Progress therein, as gave manifest Indications of extraordinary Abilities. His natural Inclination was to the Study of the Heavens, to which he so assiduously applied himself, that notwithstanding the Care of his Tutor, to keep him close to the Study of the Law, he made use of every Method in his Power, for his Improvement in the Knowledge of all Astronomy; purchased whatever Books he could meet with on the Subject; read them with great Attention; procured Assistance in difficult Cases from *Bartholomew Scultens*, his private Instructor, and having procured a small, Celestial Globe, he took Opportunities, when his Tutor was in Bed, and when the Weather was serene, to examine the Constellations in the Heavens, to learn their Names from the Globe, and their Motions from Observation. And, as it was
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the Dignity of this Kind of Study to understand the Nature and Causes of Eclipses, he looked upon it as a divine Study, and was animated by a laudable Ambition, to make himself acquainted with the Theory of the Planets, and other considerable Branches of this Science, during the three Years he resided at *Leipsick*. But the Death of his Uncle, gave Occasion to him to return Home in *May*, 1565, staying no longer, after he heard of it, than was necessary to settle his Affairs. But here he was greatly disgusted, to see the liberal Arts despised, and finding his own Relations and Friends uneasy, that he applied himself to Astronomy, (which Study, they thought, was unsuitable to a Person of his Quality) he went to *Wirtemberg*, in *April*, 1566, where the Plague, breaking out, soon occasioned his Removal to *Rostock*, and in 1569, to *Augsburg*, where he was visited by *Peter Ramus*, who was Professor of Astronomy at *Paris*, and who greatly admired his uncommon Skill in this Science. At the End of the Year 1571, he returned to *Denmark*, where he had the Satisfaction of finding an agreeable Retirement at the House of *Steno Bille*, his Mother's Brother, who was a great Lover of Learning, and one who had made no small Progress in it. He gave his Nephew a convenient Place for making his Observations, and another for building a Laboratory for chymical Experiments, which had been his Study for some Time. It was in this Place, that he discovered, in 1573, a new Star, in the Constellation of *Cassiopea*. But at this Time, his Marriage with a Country Girl of *Knudstorp*, named *Christiana*, produced such a Quarrel between him and all his Family, that the King of *Denmark* was obliged to interpose to reconcile them.

In the Winter of the Year 1574, he read Lectures upon the Theory of Planets at *Copenhagen*. And, at the King's Command, he began his Travels into *Germany* in the Spring of the Year 1575, and proceeded as far as *Venice*, and resolved to remove his Family, and settle at *Basil*. But *Frederic* the II^d, King of *Denmark*, being informed of his Design, and unwilling to lose a Man, who was capable of doing so much Honour to his Country, promised to place him in such a Situation, as
to

* This Account is taken from *Gassendi*, *Paris* Edition, 1654.

to enable him to pursue his Studies with all the Tranquility which he could desire, and bestow upon him, for his Life, the Island of *Huen*, in the *Sound*, between the Isle of *Seeland*, and the Province of *Schonen*, in *Sweden*, and that he would order an Observatory and Laboratory to be built there, and furnish him with every Thing necessary for compleating his Designs; offered him a Pension of 10,000 Crowns, *per Ann.* besides other liberal Donations. *Tycho Brahe* readily embraced his Proposal, and accordingly, the first Stone of this Observatory was laid, *August* 8, 1576. This Observatory, which had the Name of *Uranibourg* given it, with several other Buildings which belonged to it, and the Machines, which were necessary, cost a prodigious Sum of Money. And tho' the King was liberal in furnishing a necessary Apparatus; yet *Tycho Brahe* laid out of his own Estate, above an 100,000 Crowns, during the twenty Years which he continued there; for he spared nothing requisite to carry on Astronomy to Perfection. He maintained generally in his House ten or twelve young Men, who assisted him in his Observations, and whom he instructed in Astronomy and the Mathematics. *James VI.* King of *Scotland*, (afterward raised to the Throne of *England*) coming to *Denmark*, in order to marry *Anne*, King *Frederic* the II'd's Daughter, paid a Visit to our Author, in his Retirement at *Uranibourg*, and made him several noble Presents, and wrote a Copy of Verses, in Honour of him with his own Hand, as follows.

*Æthereis bis quinque globis, queis machina mundi
Vertitur, ut celso est crustatus fonice olympus
Ignibus, & pictus fulgentibus undique lychnis :
Pellucet vitriis domibus, vastisque planetæ
Orbibus, ut geminant cursus, vi & sponte rotati,
Ut miti aut torvo adspecta longe ante futura
Præmonstrant, regnisque tonans quæ fata volutet :
His tellure cupis, quæ vis, quis motus, & ordo
Cernere : sublimem deduētumque æthera terræ
Tychonis pandunt operæ? lege, disce, videbis
Mira; domi Mundum invenies, cælumque libello.*

The LIFE of TYCHO BRAHE. 181

Upon the Death of *Frederic*, in 1558, and the Succession of *Christian* the IVth, his Son, this much-beloved and envied Philosopher began to feel the Effects of the Jealousy which some Persons had conceived against him. Some of the Nobles could not, without Regret, see him receive so many Favours, and that Foreigners of high Rank and Distinction so frequently visited him: Besides this, the Physicians were uneasy, their Patients applying themselves to him for Medicines, which he generously distributed to those who had Occasion for them, and that would ask them of him; for by the Practice of Chemistry, he had discovered various Medicines, adapted to particular Disorders. *Christopher Valkendorf*, Chamberlain of the King's Household, conceived a great Dislike to him, and from the most trifling Circumstances, endeavoured to ruin his Interest with the new Ministers of the young King, and formed a Confederacy, with others, to supplant him. They pretended, that the Treasury was exhausted, and that, therefore, it was necessary to retrench a great Number of Pensions, which had been given for useless Purposes; and particularly, that of *Tycho Brahe*: That he had for a long while enjoyed it, and that it was now high Time it should be disposed of to Persons, capable of doing greater Services to the Kingdom. These Attempts, by Degrees, proved so effectual, that in the Year 1596, he was deprived of his Pension, his Fee, and his Canonry; upon which, finding himself incapable of bearing the Expences of his Observatory, he resolved to look out for some proper Retreat, in some other Country; in the mean while, he went to *Copenhagen*, whither he brought those of his Instruments, which were the least considerable, and continued his astronomical Observations, and chemical Experiments in that City, 'till *Valkendorf*, his inveterate Adversary, obtained an Order from the King, for his discontinuing them. Upon this, he removed with his Family to *Rosstock*, and afterwards to *Holstein*, in order to solicit *Henry Ranzou*, to use his Interest with the Elector of *Cologne*, to introduce him to the Court of the Emperor. *Brahe*, being sensible, at the same Time, that the Emperor was fond of Mechanism, and chemical Experiments, now published his Book, entitled, *Astronomia instaurata Mechanica*, adorned with Figures, and dedicated it to his Imperial

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Majesty;

Majesty ; and having, by these Means, obtained Orders to come to his Majesty, who was then in *Bohemia*, with a Promise, that nothing which he could desire should be wanting to him, he began his Journey in Autumn, 1598, with his Sons and Scholars, leaving his Wife and Daughters at *Ranzou's* Castle, near *Hambourg*, and being arrived at the Emperor's Court at *Prague*, his Majesty received him with the highest Marks of Respect, gave him a magnificent House, till he could procure one for him more proper for astronomical Observations, and assigned him a Pension of 3000 Crowns ; and promised him, upon the first Opportunity, a Fee for him and his Descendants. *Brabe* then sent his eldest Son to conduct his Family to him, who arrived agreeable to his Wishes ; but such is the Uncertainty of present Things, that he did not long enjoy this happy Situation ; for upon the 24th of *October*, 1601, he died of a Retention of Urine, in the Fifty-fifth Year of his Age, leaving an affectionate Wife, two Sons, and four Daughters, and was interred in a very magnificent Manner, in the principal Church at *Prague*, where he had a noble Monument erected to him. His great Skill in Astronomy is universally known, and his Works afford us ample Proof of it. Speaking of them himself, he says, “ Ever since he was 20 Years old, he was occupied either in acquiring the Knowledge of the celestial Bodies, or the Nature and Properties of Metals, Gems, Minerals, &c. by Study and Experiments ; and that he had pursued his Studies, on worthy Motives, and communicated his Discoveries for general Usefulness, appears from the inward Pleasure he felt at the near Approaches to his last Moments, solacing himself principally from this Reflection, *That he had not lived in vain, and that he hoped his Labours would redound to the Glory of God.* He then enjoined his Son, and Son-in-law, to take Care, that none of his Works were lost ; and that they might safely rely on the Goodness and Protection of the Emperor, who, he did not doubt, would take Care of them. Exhorted the Students to attend closely to their Exercises, and to *Kepler* he recommended the finishing of the *Tables* he had constructed, for regulating the Motion of the Planets : Thanked the illustrious and noble *Eric Brahe*, a Counsellor to the King of *Sweden*, and his Kinsman, for his long and faithful

Friendship,

The LIFE of TYCHO BRAHE. 183

Friendship, and then resigned his Breath. The principal Part of his Writings, as the learned *Gassendus* informs us, are,

I. An Account of the new Star, which appeared *November* the 11th, 1572, in *Cassiopea*. Published at *Copenhagen*, 1573, in 4to.

II. An Oration, concerning the mathematical Sciences, pronounced in the University of *Copenhagen*, in the Year 1574. Published by *Conrad Aslac*, of *Bergen* in *Norway*.

III. A Treatise of the Comet, in the Year 1577, immediately after it disappeared. Nine Years afterward, he revised it, and added a 10th Chapter. Printed at *Uranibourg*, 1589.

IV. Another Treatise on the new Phenomena of the Heavens. In the 1st Part of which, he treats of the Restitution, as he calls it, of the Sun, and of the fixed Stars: And, in the 2d Part, of a new Star, that then had made its Appearance.

V. A Collection of astronomical Epistles. Printed at *Uranibourg*, 1596, in 4to. *Nuremberg*, 1602, in 4to. and at *Franckfort*, in 1610; it was dedicated to *Maurice* Landgrave of *Hesse*; because there are in it a considerable Number of Letters of the Landgrave *William* his Father, and of *Christopher Rothmann*, the Mathematician of that Prince, to *Tycho*, and of *Tycho* to them both.

VI. The mechanical Principles of Astronomy restored. Published at *Wandelsburg*, 1598, in Fol.

VII. An Answer to the Letter of a certain *Scotsman*, concerning the Comet, in the Year 1577.

VIII. Concerning the Composition of an Elixir for the Plague, addressed to the Emperor *Rodolphus*.

IX. An Elegy upon his Exile; published at *Rostock*, in 1614, 4to.

X. The *Rudolphin Tables*, which he had not finished when he died; but were revised, and published by *Kepler*, as *Tycho* had desired. He gave them this Title, in Honour of his great Patron the Emperor *Rodolphus*.

XI. An accurate Enumeration of the fixed Stars. Addressed to the Emperor *Rodolphus*.

XII. A complete Catalogue of 1000 of the fixed Stars, which *Kepler* has inserted in the *Rudolphin Tables*.

XIII. *Historia Cœlestis*: Or, a History of the Heavens. In two Parts. The 1st contains, the Observations he had made at *Uranibourg*. In 16 Books. The Latter contains, the Observations made at *Wandelsburg*, *Wittenberg*, *Prague*, &c. In 4 Books.

XIV. Is an Epistle to *Caster Pucer*. Printed at *Copenhagen*, 1668.

Besides these Works, we find, he was frequently employed in composing *Latin Verse*, though not very fortunate in the Attempt, there being too frequent Faults in regard to Quantity; and tho' it may appear like drawing a Veil over the Lustre of his Character, we cannot, as impartial Historians, but acknowledge, he was too credulous, with respect to judicial Astrology, and likewise very superstitious, with regard to Pre-

fages,

fages, Omens, &c. It was said of him by *Gassendus*, if he met an old Woman, when he went out of Doors, he used to turn back immediately ; being persuaded, it was a bad Omen. And he did the same, upon a Journey, if he saw an Hare in the Road. While he lived at *Uranibourg*, he had, at his House, a Mad-man, whose Name was *Lep*, whom he placed at his Feet when he was at Table, and fed him himself ; and, as he imagined, that every Thing that mad Persons said, presaged something or other, he observed carefully, all that his own Man said ; and because it happened sometimes to prove true, he fancied he might depend upon all that he spoke. He was moreover censured as very positive, and impatient of Contradiction. He was born in the *Lutheran* Religion, which was the established one of his Country, and continued in it till his Death. Nevertheless, his Character was always honoured and esteemed by the Learned, whose Sentiments in general may fitly close our History of him. “ *Kepler* styles him the *Hipparchus* of our Age ; *Vossius*, in his Book *De Scientiis Mathematicis*, tells us, that he gained an immortal Reputation by his Works, being inferior to none of the preceding Astronomers ; and that in his Observation of the Fix’d Stars, he did not implicitly acquiesce in what *Hipparchus* had done, but exceeded the Industry of *Ptolemy*, and the Followers of *Alphonsus*. And Mr. *Boyle*, in his *Physiological Essays*, observes, that the noble *Tycho*, as he styles him, besides his Time and Industry, laid out much greater Sums of Money on Instruments, for astronomical Observations, than any Man, whom we have heard of in later Times ———

It is well known, he was the Inventor of a new System of the World, which he endeavoured to establish on the Ruins of the *Copernican* System, but it did not succeed ; for as on the one Hand, nothing could be more elegant, simple and rational, than the *Copernican* System ; so on the other, nothing could be more extravagant and absurd, than that of *Tycho*’s Hypothesis, which placed the Earth in the Center, and the Sun with the whole System of Planets about it, revolving about the Earth once in 24 Hours. This could only shew, how fond Mankind are of their own Inventions, and how ambitious of Reputation, which they endeavour sometimes to attain, in Opposition to the clearest Truths, and even Demonstration itself.

The LIFE of CHRISTOPHER COLUMBUS.

CHristopher COLUMBUS, Philosopher and Mathematician, was born in the Dominions of *Genoa*, in 1442. Authors somewhat differ with respect to the Genealogy, but all in general allow, that he descended from an antient and reputable Family, from Parents, who took Care to instil into his Mind the Rudiments of Literature, and gave him a Taste for further Improvement in Science, for which he very early discovered an uncommon Genius, and for the Attainment of which, when but a Youth, he applied himself with great Diligence; and to this End, put himself under the Care of proper Tutors at *Pavia*, for the Study of Arithmetic, Geography, Geometry, Philosophy, Painting, and other Sciences: And it appears by his Letters to their Majesties the King and Queen of *Spain*, that he was well versed in Natural and Experimental Philosophy, and was a curious Observer of whatever tended to his Improvement in Navigation; for the Result of his Enquiries led him to visit foreign Nations; and to encrease his Knowledge by the Practice, as well as the Theory of this Art, his first Step to this End was, to visit his elder Brother, then residing at *Lisbon*, to receive his Assistance in drawing Charts of the Coast, &c. and from thence proceeded on his first Voyages to the *East* and *West Indies*.

After this enterprising Genius had made some Improvement in the Sciences, and had been a few Voyages to Sea, his Studies presented to his Imagination (as it were) new Worlds; and that these were not the mere Fiction of the Brain, he assigns the following Reasons.

1. He concluded, that all Sea and Land composed a Sphere, or Globe, which might be gone about from East to West.
2. That a great Part of this Globe had been travelled over, and that then there only remained to discover that Space which lay between the Eastern Bounds of *India*, known to *Ptolemy* and *Marinus*, round about Eastward, till they came through our Western Parts to the Islands *Azores* and *Cabo Verde*, the most Western Parts yet discovered.

3. He considered, that this Space, lying between the Eastern Limits known to *Marinus*, and the aforesaid Island of *Cabo Verde*, could not be above $\frac{1}{3}$ Part of the great Circumference of the Globe; since the said *Marinus* was already gone 15 of the 24 Parts, into which the World is divided towards the East, and therefore to return to the said Isle of *Cabo Verde*, there wanted about 9 Parts; for the said *Marinus* is said to have begun his Discovery towards the West.

4. He reckoned, that since *Marinus* had, in his *Cosmography*, given an Account of 15 Hours, or Parts, of the Globe towards the East, and yet was not come to the End of the Eastern Land, it followed of Course, that the said End must be much beyond that; and consequently, the farther it extended Eastward, the nearer it came to the Island *Cabo Verde* towards our Western Parts; and that if such Space was Sea, it might easily be sailed in a few Days, and if Land, it would soon be discovered by sailing Westward.*

Fully persuaded of the Truths deduceable from his Reasoning, and the Authority of some learned Men in Favour of it, he resolved to try the Experiment, and to venture his Honour and Reputation, his Health, and even Life itself, in Quest of those other Worlds, or Parts, which yet remained undiscovered; it is highly reasonable to suppose, he was likewise animated, on the other Hand, from the Persuasion of the great Service it might be to the Public, the Interest that might accrue to himself, and the Honour and Reputation future Ages would justly pay to his Memory.

Accordingly he addressed himself to some Princes in *Europe*, who laughed at the Enterprize, and stiled it a Dream. But *Ferdinand* and *Isabella*, who then reigned in *Spain*, received him more favourably, and agreed to furnish him with three Ships, on the Conditions by him stipulated, viz. “That if he made
“no Discoveries, he should have no Reward; that if he did,
“he should be Viceroy by Land, and Admiral by Sea, and
“have the Tenths of the Profits of all the Countries discovered
“by him, and that these Privileges should be hereditary to his
“Family.” This Agreement was made in *April* 1492, at the
Siege

* *Churchill's Voyages; Life of Columbus*, by his Son, Page 487.

Siege of *Granada*, and on the second of *August* following, *Columbus* set out from *Port Palos de Moger* in *Spain*, and was then dignified with the Title of Admiral, with three Ships, and about 100 Men. On the 11th, they came to the *Canaries*, and stayed at *Gomera* 'till *September* 6, when they failed to prosecute their intended Discovery; but at length, when they were got out of Sight of Land, the Men grew very uneasy, but he found Means to divert them, partly by Promises, and partly by Threats.

In this Voyage *Columbus* is said to be the First who observed the Variation of the Compass.

On the 11th of *October*, the Admiral perceived a Light, resembling that of a Candle, and when it was full Day, he landed at *Guana Bay* in his Boat, with the Royal Standard, followed by the Captain, and other Officers. They kneeled on the Shore, kissed the Ground, and thanked God for their safe Arrival. Then the Admiral stood up, called the Island, which is one of the *Luccas*, *St. Salvador*, and took Possession of it, in the Name of their Catholic Majesties, with the usual Formalities. The Natives, filled with Wonder and Joy, were fond of ingratiating themselves into their Favour, and of getting Something from them by way of Exchange. He was at length kindly receiyed by their Chiefs, and Some of them, who were most apprehensive of his Language, became Interpreters to Others.

The next *Sunday*, being the 15th of *October*, the Admiral ran along the Coast of the Island towards the North-west in his Boats, to discover whatever might be curious or useful. He found a large Bay, or Harbour, capable of containing all the Ships in *Europe*. The People along Shore gathering, with great Admiration, to see how fast the Boats passed the Shore, several swam out to them, to salute and carry them Presents. At length *Columbus* came to a Part, where he saw six Houses of the *Indians*, with Gardens about them, as pleasant as those in *Castile* in *May*; but as it became tiresome for his Men to row, on *Monday* the 16th, he returned by another Island that is seven Leagues from the other, called *St. Mary of the Conception*, on that Side of this Island next *St. Salvador*, extended North-west, five Leagues in Length, but the Admiral went on that Side

Side which lies East and West, and being landed, the People of the Island ran together to see the Christians. The Admiral, perceiving this Island, as to its Produce and Inhabitants, were much the same as the last, sailed westward to another Island considerably bigger, and anchored upon the Coast of it, which was called *Fernandina*; but before he reached this Island, the Admiral found a Man in a small Canoe, who had some Water and a little Earth, like Vermilion, going to *Fernandina* to carry News of the Christians, but he was courteously received by the Admiral, and taken into his Ship, designing, as soon as he came to Land, to set him ashore to spread the News. The good Account he gave, caused the People of *Fernandina* to come aboard in their Canoes, and to bring their Curiosities, to present, or exchange. These People seemed to be wiser and discreeter than the Former, and were for having what they esteemed an Equivalent in Exchange. Among other notable Things which they saw in that Island, there were some Trees which appeared to be grafted; because they had Leaves and Branches of four or five Sorts, and yet were natural. They also saw Fishes of several Sorts, and fine Colours, but no Sort of Land-Animals, except Lizzards, and Snakes. The better to discover this Island, they sailed to another Part of it, but finding nothing more extraordinary, on *Friday* the 19th, they sailed away to another, called *Sacmotto*, to which he gave the Name of *Isabella*.

The Admiral having learnt the principal Secrets of the Island *Isabella*, its Product and Manners of the People, he set sail for a large Country, much applauded by them, called *Cuba*, which lay towards the South, where he came to Anchor. Here the Trees were thick and tall, and adorned with Fruits and Blossoms, different from ours, and Abundance of Birds; but the People immediately fled for Fear. Here the Admiral sent two Christians with one of the *Indians*, brought from *St. Salvador*, to travel up into the Country, and make much of the Natives; and that he might lose no Time, he laid his Ship up a-shore to careen.

After they had tarried the limited Time, they returned, and acquainted the Admiral with the Products of the Country, and Manners of the People. They having the Consent of some *Indians* to go aboard the Ship, and sail with them, two were accepted

The Life of CHRISTOPHER COLUMBUS. 189

accepted of; but no Husband was to leave the Wife, or Wife the Husband; neither the Child the Parent.

About the 13th of *November*, he came about to the Eastward, to the Island of *Bobio*, and thence to *Hispaniola*. On *Sunday*, the 13th of *January*, being near the Cape, called *Enamorado*, the Admiral sent some of the *Christians* and *Indians* ashore, and found the Natives much more fierce, and prepared with Bows and Arrows. The Admiral called this Place *Golpbo de Flechas*; or the *Gulph of Arrows*. The chief Produce of the Island was Cotton.—On the 16th of *January*, they sailed in Quest of other Islands, and for 15 Days met with such windy, tempestuous Weather, that they could not land any where. At length, they reached the Island of *St. Mary*, one of the *Azores*, and the People on this Island, as well as those in the Ship, were greatly astonished at the providential Escape of the Admiral; and understanding what the Admiral had discovered, seemed to rejoice, giving Praise to God; and three of them came on board with fresh Provisions, and many Compliments from the Commander of the Island. The Admiral and his Crew, remembering they had made a Vow on the *Thursday* before, to go bare-foot, and in their Shirts, the first Land they came to, to some Church of our *Lady*, they were all of Opinion, they ought to perform it here; especially, being a Place where the Governor and People expressed so much Affection and Tendernefs for our Men, and belonging to a King, who was so great a Friend to him at *Castile*. Therefore the Admiral desired these three Men to repair to the Town, and cause the Chaplain to come, that had the Keys of the Hermitage, that he might say Mass there. These Men consenting, they went into the Caraval's Boat with half the Ship's Crew, that they might begin to perform their Vow, and on their Return, the Rest might do the same; but being landed, the Governor and Abundance of People from the Town, who lay in Ambush, on a sudden rushed out upon them, and made them Prisoners, taking their Boat, without which they thought they could never get away from them.

The Admiral, thinking they staid too long, began to suspect some Misfortune had befallen them, either at Land or Sea; he resolved therefore with his Ship to sail about a Point. Being come

near, he saw Abundance of People on Horse-back, many of whom dismounted, and went into the Boat to attack the Caraval. The Admiral therefore mistrusting what might happen, and perceiving that thro' their Treachery he was put under great Difficulties, began to consider how he might extricate himself; and first he ordered his Men to be in Readiness and armed, but to make no Shew of Resistance, that the *Portuguese* might come the nearer. When they were near the Admiral, the Captain of them, stood up, and desired to parley, which the Admiral granted, thinking he would come on board, and might be secured without Breach of Faith; but the *Portuguese* did not come nearer than to be heard. When the Admiral proceeded to represent their unreasonable Conduct, and how much it would be disapproved and resented by their Catholic Majesties; the Captain and his Men, disregarding this, he suspected some Breach had happened between the two Crowns since his Departure, and determined to return their ill Treatment, by making Reprisals; but the next Day, the Wind increasing, he was obliged to put to Sea, and sail towards the Island of *St. Michael*; but the Weather growing calmer, he resolved to return to the Island of *St. Mary*, to recover his Men, and an Anchor that he had lost; and on his Arrival there, there came off a Boat, with five Men and a Notary, who upon Security went aboard, and lay there that Night. The next Day, they requested him to produce his Commission from the King of *Spain*, which the Admiral complied with, as thinking it better, at that Time, to suppress his Resentment, and stipulated for the Return of his Seamen, which was soon after complied with.

On *Sunday* the 24th, the Admiral sailed from the Island of *St. Mary* for *Spain*, but in the Voyage met with a great Storm, and was forced upon a Rock off *Lisbon*. The Admiral, however, with great Skill got into *Lisbon* River, to the great Astonishment of the People of that Country and their Seamen, who ran from all Parts to behold, as it were, some Wonder. After he had anchored, he presently sent one Express to his Catholic Majesty, with the News of his Arrival, and Another to the King of *Portugal*, asking Leave to anchor before the City, as being more safe.

The Life of CHRISTOPHER COLUMBUS. 191

On *Tuesday* the 5th of *March*, the Master of a great Guard-ship, that lay in the *Harbour*, came with his Boat full of armed Men to the Admiral's Caraval, requiring him to come along, and give an Account of himself to the King's Officers. He answered, that as he was one of the King of *Spain's* Admirals, he was not obliged to obey any such Summons. He was then required to send his Boatswain. The Admiral refused that also, and produced the King of *Spain's* Commission; upon which, he was satisfied, and went back to his Ship, and gave such a surprizing Account to *Alvaro de Acuma*, his Captain, that he came immediately with Trumpets, Fifes, Drums, and great State aboard the Admiral, expressing much Kindness, and offered his Service. The next Day, it being known at *Lisbon*, that the Ship came from the *Indies*, great Numbers went on board to see the *Indians*, and hear News; some of them praising God for those great Discoveries he had made, and Others upbraiding their King's Incredulity, whereby they had lost the Advantage that might otherwise have accrued to that Nation. The next Day, the King ordered his Officers to present the Admiral with all Kinds of Provisions, and Necessaries for himself and his Men, without asking any Pay. At the same Time, he wrote to the Admiral, congratulating him on his happy Arrival, and inviting him to come and visit him. He accepted the Invitation, and on *Saturday*, the 9th of *March*, the Time appointed, the King ordered all the Nobility of his Court to go out to meet him; and being come into his Presence, the King did him great Honour, commanding him to put on his Cap, and sit down; and having with a chearful Countenance heard the Particulars of his prosperous Voyage, offered him all he stood in need of, for the Service of their Catholic Majesties, intimating, however, that he thought, that forasmuch as he had been a Captain in *Portugal*, that Conquest belonged to him; to which the Admiral replied, he knew no such Agreement, and that he had strictly observed his Orders, which were not to go to the Mines of *Portugal*, nor to *Guinea*. The King said all was well. The Admiral having staid there all *Sunday* and *Monday*, and been at Mass, took Leave of the King, with great Expressions of Kindness. On his Return, he passed by a Monastery, where the Queen then was, who sent to desire him
not

not to pass without seeing her, and did him all the Favour and Honour due to the greatest Lord. The Admiral had the Offer of being conducted to *Spain* by Land, but he thought it most expedient to return Home in his Caraval with his Men.

On *Wednesday*, the 13th of *March*, the Admiral set sail for *Seville*, and on the *Friday* following, at Noon, arrived at *Saltes*, and came to an Anchor in the Port of *Palos*, whence he had set out, on the 3d of *August*, 7 Months and 11 Days before his Return. He was there received by all the People in Procession, giving Thanks to God for his prosperous Success, which it was hoped would redound so much to the Propagation of Christianity, and the Increase of their Catholic Majesties Dominions; all the Inhabitants looking upon it as a great Matter, that the Admiral set out from thence. The Admiral soon after set out for *Barcelona*, where their Catholic Majesties then were. He got thither the 15th Day of *April*, having before sent their Majesties an Account of the happy Success of his Voyage, which was extraordinary pleasing to them, and they ordered him a most solemn Reception, as to a Person, who had made such singular Discoveries, and done such eminent Service. The Court and City went out to meet him, and their Catholic Majesties sat in public, with great State, under a Canopy of a Cloth of Gold; and when he went to kiss their Hands, they stood up to him as to a great Lord, and caused him to sit down. Having given a brief Account of his Voyage, they gave him Leave to retire to his Apartment, whither he was attended by the Court, and when the King rode about *Barcelona*, the Admiral was permitted to ride on one Side of him, and the *Infante Fortuna* on the other; a Favour never granted to any before but the *Infante*.

Columbus having given these Proofs, not only of his uncommon Skill in Navigation, but of his great Abilities, Oeconomy, and Integrity; and having received many Marks of their Majesties Favour, confirmed by Letters Patent, it was resolved by their said Majesties in Council, that the Admiral should proceed on another Voyage, in order to people the Island of *Hispaniola*, make other Discoveries, erect Colonies, and propagate Christianity, &c. and in order to render the Title of their Catholic Majesties more secure, as well to what had been already discovered,

The Life of CHRISTOPHER COLUMBUS. 193

discovered, as what might be afterward, it was resolved, to apply to the Pope (then *Alexander VI.*) for his Approbation, which he was pleased to give under his Holiness's Seal.

All Things necessary for his intended Voyage being prepared, the Admiral weighed Anchor in the Road of *Cádiz*, on the 25th of *September*, 1493, and steered S. W. for the *Canary Islands*. In this Voyage, he visited the Island of *Dominica*, *St. Mary's*, *Guádalupe*, *Montserrat*, *St. Maria*, *la Antigua*, *Hispaniola*, the City of the *Nativity*, established a Colony at *Isabellá*, and discovered Gold-mines at *Ciboa*. Thence he sailed to the Islands of *Jamaica* and *Cuba*, in many of which Islands, Provinces, &c. having taken the utmost Pains to establish Christianity, he concluded to return to *Spain*, to give their Catholic Majesties an Account of the State and Condition of those Islands. Accordingly, on the 10th of *March*, 1496, he set sail, but meeting with adverse Winds, was obliged to fall off towards the South to the *Caribbee* Islands, and came to an Anchor at *Marigalante*, on the 9th of *April*, where, after furnishing himself with Bread, Water, Wood, &c. on the 20th of *April*, he sailed for *Spain*.

Having made but little Way, and the Ships being full of People, on the 20th of *May*, they began to be very sickly, and were reduced to Want of Provisions; besides which, a Difference of Opinion in the Pilots on board occasioned very great Uneasiness. However, this afforded an Opportunity for the Admiral to discover superior Knowledge, as well as Equanimity of Temper, assuring them he was but little West of the *Azores*; for, according to his Journal, the *Dutch* Compasses varied, as they used to do, a Point; and those of *Genoa*, that used to agree with them, varied but very little; but afterward, sailing East, varied more; which he urged as a Reason of their being West of the *Azores* 100 Leagues. He made other Observations and Remarks, according to his superior Skill, and to the great Satisfaction of the whole Ship's Company. They had Sight of Land much sooner than was apprehended possible, even by the Pilots, and landed at *Odemira*, between *Lisbon* and *St. Vincent*, on the 8th of *June*.

Columbus had but just arrived in *Spain*, and presented some Curiosities to their Majesties, and given a proper Account of

what had occurred of Importance in this Voyage, and also received some Marks of their Majesties Favour, than he was requested (as absolutely requisite) to go to the *Indies* a third Time, which he complied with, tho', it is said, not without Reluctance, some Persons in his Absence having found Means to depreciate his Discoveries.——

The Admiral set sail on the 30th of *May*, 1498, from the Bay of *St. Lucar de Berrameda*, and on the 7th of *June* arrived at the Island of *Puerto-Santo*, where he took in some Provisions; and thence sailed to *Gomera*, where he arrived on the 19th; but making but short Stay, he arrived, on the 25th of *June*, at the Island *de Sal*, one of those of *Cabo Verde*, and on the 5th of *July*, sailed from thence to discover the Continent, steering by S. W. till he came under the Equinoctial, about the Middle of *July*. He says, that having steered due West for some Time, in order to find Land, he very carefully took the Latitude, and found a wonderful Difference between that and the Parallel of the *Azores*; for there, when the *Charles's Wain* was on the Right, that is, East, then the North Star was lowest, and from that Time began to rise; so that, when the *Charles's Wain* was over Head, the North Star was two Degrees and an Half higher, and being once past that, began again to descend the same five Degrees, it ascended. This, he says, he observed several Times very carefully; but that where he was at this Time in the *Torrid Zone*, it happened quite contrary; for when the *Charles's Wain* was in its greatest Elevation, he found the North Star six Degrees high, and when the *Charles's Wain* came to the West, in six Hours Space, he found the North Star eleven Degrees high, and then in the Morning, when the *Charles's Wain* was quite depressed, tho' it could not be seen because of the Inclination of the Pole, the North Star was six Degrees high; so that the Difference was ten Degrees, and it made a Circle, whose Diameter was ten Degrees; whereas, in the other Place, it made but five, lowering the Position; for there it is lowest, when the other is West, and here when in its Elevation. We might here proceed to take Notice of the Admiral's discovering the Island of the *Trinity*, and thence sailing to the Cape, called *Puntal del Arrenal*, and afterwards continued his Course to *Paria*, where he found Gold, and many
precious

The Life of CHRISTOPHER COLUMBUS. 195

precious Pearls. He was exposed to many Dangers during this long Voyage ; but as we have already been as particular as the Limits of our History will permit, and these Particulars more properly belong to Naval History, we shall bring this Account to a Close, by some Particulars relating to his personal Character.

History informs us, that he was a Person of great Evenness of Temper, seldom moved to Passion ; but when most provoked, was never heard to swear, or utter any other Expression than *God take you*. He was very careful to preserve the same Abhorrence to Swearing in those who sailed with him, and as much as possible, to promote Peace and good Order, and was remarkably tender of his sick Men. According to that Religion he professed, he was censured as superstitious in many Observances, and too ready to regard some Phænomenas in Nature as Omens, or Presages of some extraordinary Events, and generally construed them in his own Favour.

One remarkable Use which he made of his Knowledge was so wisely adapted to his particular Circumstances at that Time, it deserves our Notice. While he lay off *Hispaniola*, there arose some Difference between him and some of the *Indians* ; and the Mutineers so far prevailed, that the Natives slacked their Hands in supplying him with Provisions, which reduced him to great Distress ; but he extricated himself by this lucky Stratagem. He knew there would be a Lunar Eclipse, in three Days Time, at the Rising of the Moon, at the Beginning of the Night, and sent an *Indian* Interpreter for the chief *Indians* of the Place, to discourse them about a Matter of Importance. When they came, he told them by the Interpreter, that the *Christians* GOD, who lived in Heaven, took Care of the Good, and punished the Bad ; and that the same *God* would punish the *Indians* for not bringing Provisions to him and his Men ; and as a sure Presage of it, they should see the Moon rise, such a Night, with an angry and bloody Aspect. Some of the Natives were frightened at this Relation, and Others mocked him ; but when they saw the Eclipse, as he had foretold, they believed what he had said, came and prayed him to intercede with his *God* on their Behalf, and promised to supply him with what Provisions he needed. The Admiral replied, that he would ; and as a

Proof

Proof of it, they should soon see the Moon put off her angry Countenance by Degrees. The Eclipse being over, they concluded the Admiral would not have known this, except it had been revealed to him from Heaven.

Upon the Admiral's Return from this third and last Voyage, he found his favourite Queen *Isabella* dead, and the King not so hearty in his Favour as before, which increased the Indisposition of Body under which he laboured, and he declined, and died piously, on *May* the 20th, 1506, at the City of *Valadolid*, aged 64. His Body was afterwards conveyed to *Seville*, and there, by the Catholic King's Order, magnificently buried in the Cathedral, and an Epitaph, in *Spanish*, cut on his Tomb, in Memory of his renowned Actions, and Discovery of the *Indies*.

*A CASTILLA, y a LEON;
Nuevo Mundo dio COLON.*

In English :

TO CASTILE and LEON, COLUMBUS has given a new World.

Yet this brave Adventurer had not the Honour of giving his own Name to this new World; but was robbed of it by *Americus Vespucius*, a *Florentine*, who was sent in 1497, by *Emanuel*, King of *Portugal*, to continue the Discoveries made by *Columbus*, as appears from the following Account.

Americus Vespucius's Discoveries.

THIS Gentleman was a Native of *Florence*, and made the next considerable Discoveries, of which we shall give an Extract, from his own Account, to King *Ferdinand* of *Castile*, and the Duke of *Lorrain*, as we find it in *Grynæus's Novus Orbis*, printed at *Basil*, 1537. He made two Voyages towards the West, at the Command of the said King, and two to the South, by Order of *Emanuel*, King of *Portugal*.

He began his first Voyage, *May* 20, 1497, with four Ships from *Cadix*; he refreshed at the *Canaries*, and 27 Days after, he

Americus Vespucius's *Discoveries*. 197

he sailed from thence, he arrived at a certain Land, about 1000 Leagues West of the *Canaries*, in N. Lat. 16. 75 Deg. more West than the *Canaries*, and upon their Landing in their Boats, they found Abundance of Inhabitants, all naked; and notwithstanding they used several Methods to allure them, they would not come near the *Spaniards*. He left that Place in Quest of a good Harbour, which he happily met with in a few Days, and found the People almost as shy as the Former; at length, however, they were prevailed upon by some trifling Presents, as Glasses, Bells, &c. after which, Multitudes of the Natives came swimming to them; at which both the Men and Women were remarkably dexterous.

Americus says, the Situation of the Country was excellent, and he found some Signs of Gold in it; but being ignorant of the Language, he could get no Discoveries from the Inhabitants. Parting hence, he coasted along the Shore, passing by many Shoals, and as he landed at several Places, where he found the Language differed more than the Manners of the People, sometimes taking the *Indian* Natives on board with their Consent, and at other Times making them Prisoners. They returned again to *Spain* with 222, on the first of *October*, 1499, where they were joyfully received, and sold their Prisoners.

Americus began his second Voyage from *Cadiz*, on *May* 11, in the following Year, and, after 19 Days sail, came to a new Land, which he supposed to be a Continent, in S. Lat. 5, about 500 Leagues from the *Canaries*. This Country was almost covered with Marshes, and had several great Rivers, which contributed to its Verdure; and there were many fine tall Trees, but he saw no Inhabitants, though he found many Signs of its being peopled. He tried to land at several Places, in order to make new Discoveries, but the Tides ran so strong, that he could not; at length, however, he landed in an Island, where the People were of an uncommon Size, bold, vigorous and warlike, having Bows and Arrows, and when attacked, defended themselves with great Intrepidity. This *Island*, therefore, was called the *Isle* of *Giants*. Being now bound homewards, he came to another Country, where the People were friendly. Here he stayed 47 Days, from whence he sailed for *Antigua*, formerly discovered by *Columbus*, and leaving that

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Place

Place, on *July* 22, he arrived at *Cadiz* the 8th of *September* following.

After this second Voyage, whilst *Americus* stayed at *Seville*, *Emanuel*, King of *Portugal*, invited him, by Letters, to come to *Lisbon*, and promised to do great Things for him. *Americus*, however, declined it, because of his bad State of Health; but was prevailed on by a second Message, and set out from *Lisbon* with three Ships, on the 10th of *May*, 1501; sailed from thence to the *Canaries* with a S. W. Wind, and arrived at that Part of *Ethiopia*, called *Besilicca*, under the *Torrid Zone*, where taking in Wood and Water, he steered South through the *Atlantic* Sea, and after 67 Days Sail, thro' very dangerous Tempests, he arrived at an Island, 700 Leagues from the Coast of *Afric*. On the 17th of *August* following, he made a new Discovery, and anchored about a League and a Half from the Shore in S. Lat. 5. The Country looked very green and pleasant, but meeting with no Inhabitants, he returned to his Ship, leaving some Glasses, Bells, &c. to entice the Natives to Friendship, if any should come down; but they were too shy to correspond, or suffer themselves to be taken. They parted from thence, and sailed along the Shore round a Point, called *Vincent's Field*, about 150 Leagues. Here they landed, and found the People more civilized. They met with great Numbers of Canes, and Trees, which were large, green Pipes, some of which were dry, on the Tops of the Trees. Three of the Inhabitants willingly came on board, to go along with *Americus* to *Portugal*. He sailed thence to the South, 'till he came beyond the *Tropic* of *Capricorn*, in S. Lat. 32, where he governed his Course by the Stars of the South Pole, which, he says, were many more, greater and clearer, than those of the North; all which he noted down in his *Journal*, with their Declination, &c. He reckoned himself then 700 Leagues from *St. Vincent's Field* before-mentioned, but found nothing very remarkable this Voyage, except Abundance of *Cassia*-trees, without discovering any valuable Minerals; after the taking in Wood and Water for six Months, he steered his Course homeward, and, in 16 Months, arrived at *Lisbon*, in 1502.

He began his fourth Voyage from *Lisbon*, on the 10th of *May*, 1503, with six Ships, and after touching at the Islands of
Cape

Americus Vespucius's Discoveries. 199

Cape Verd, the Commodore, contrary to the Mind of *Americus*, and the Rest, would needs sail to *Sierra Leona*, on the South Coast of *Afric*, where they were shattered by a terrible Tempest, and obliged to return home, after an unsuccessful Voyage, where they arrived on *June 28*, 1504.

This is the Substance of what *Americus* says of his own Voyages, which we have inserted for the Satisfaction of the Curious. He says, he kept Journals, and designed to publish them with the Geography of the Places which he discovered; but if he did, they are not now to be come at. Upon the Whole, it is evident, that this was a Part of *Columbus's* Discoveries, notwithstanding this Country goes under *Americus's* Name, as if he was the principal Discoverer.

About this Time, and in the sixteenth Century, there were many Persons who distinguished themselves, by making some important Discoveries; more especially in North and South *America*; for which they were in some Measure qualified by superior Attainments in the Astronomical Sciences, as well as by their Skill in Navigation: And to which they were animated by a Love of their Country; whose Names on these Accounts, as well as the signal Service they have done their Successors in the Art of Navigation, deserve to be remembered, and transmitted with Esteem to latest Posterity.

Among these were *John* and *Sebastian Cabot*, *John Ponce de Leon*, *Cortez*, *Saavedra Guzman*, *Mendoza*, *Solo*, *Gonsalvo Pizarro*, &c. Foreigners; and amongst our own Countrymen, *Sir Martin Forbisher*, *Sir Francis Drake*, *Mr. John Davis*, &c. and likewise of some others, whose Names will be as lasting, as our Commerce with those Parts, *Hudson's Bay*, *Virginia*, &c. But as the History of those Persons are more properly the Subject of Naval History, we shall return from this Digression to the Life of those more celebrated for mathematical and philosophical Sciences.

The LIFE of CHRISTIANUS LONGOMONTANUS.

Christianus Longomontanus, was born in 1652. His Father's Name was *Severinus*, and his Mother's *Marina*. (The Name of *Longomontanus*, is said to be derived from an obscure Village of *Cymbia*, where he resided) and as they followed Husbandry, *Christianus* was trained up in great Measure to that Employ; and in his younger Years was only permitted to attend a School, as the Circumstance of his Parents, and Leisure from that Employ would permit. The early Proofs he gave of his Genius for the Study of the mathematical Science, ingratiated him into the Esteem of his Relations, from whom he received Encouragement. Prompted, however, by an eager Thirst after Learning, at 15 Years of Age, he withdrew from his Country, and entered himself in a School at *Vigurgh*, at the Distance of about 12 Miles from the Place of his Nativity; there purposing to subsist himself by his Industry; and yet make farther Proficiency in his beloved Studies, to which he applied himself with great Affiduity; and having made a surprising Progress in the Mathematics, under that eminent Philosopher *Matthias Hansius*, he went to *Copenhagen*, where, by his singular Industry, he so well approved himself to his Professors, that they gave the highest Commendation of him to *Tycho Brabe* who (having in the Year 1588, lost his *Mecænas* King *Frederick II.*) resided now at the Isle *Huenna*, readily accepted of *Christianus* as his Assistant, principally in his astronomical Labours, and in the Reformation of his Catalogue of the fixed Stars, and in the Theory of the Moon. During his Continuance here, his indefatigable Labour, Diligence and Fidelity, gained him the sincere Affection and Esteem of this great Man; and soon after *Tycho's* Departure from *Denmark* in 1698, he came to him in *Bohemia*, where he prosecuted his Studies, and finished his Theory of the Moon. In the Year 1600, having received his commendatory Letters, he took his Leave, and returned to his own Country, where, in the University of *Copenhagen*, he was honoured with a mathematical Professorship, in which

The Life of JOHANNES SCHONERUS. 201

which he acquitted himself with great Reputation, employing his Time and Thoughts in reviewing the Improvements of others; farther investigating the Nature and Phænomena of the Heavens, and committing it to Writing for the Improvement of succeeding Generations. His principal Work now extant is his *Danish Astronomy*, which was highly esteemed by the Learned at that Time, and contains all the great Discoveries of *Regiomontanus*, *Purbachus*, and *Tycho Brahe*. To which he added an Appendix, containing the new Phænomena of the Heavens. This Work was first published in the Year 1621, which, besides many others, rendered him remarkable as a Philosopher, while living, and much regretted at his Death. History does not furnish us with many other Particulars relating to it, but that he died in the Year 1647, in the 85th Year of his Age.

The LIFE of JOHANNES SCHONERUS.

JOHANNES SCHONERUS, Philosopher and Mathematician, was born at *Carelstat* in *Germany*, A. C. 1477; his early Propensity to the Study of those Sciences may be deemed a just Prognostication of the great Proficiency which he afterward made in them. So that from his uncommon Acquirements, he was chosen Mathematical Professor at *Nuremberg*, when but a young Man. He was very famous for his *Astronomical Tables*, which he published after those of *Regiomontanus*, and to which he gives the Title of *Resoluta*, because of their Clearness, as *Vossius* observes. But notwithstanding his great Penetration, he was much inclined to Judicial Astrology, which he took great Pains to improve. His other principal Writings were, the Use of the Celestial and Terrestrial Globes; his *Astronomical Equator*; his *Organum Uranicum*; but principally his *Gnomonics*, or large Treatise of *Dialling*, in Folio, published in 1551, render him more known in the learned World than all his other Works besides; wherein he discovers a surprizing Genius and Fund of Learning of that Kind; This is the only Book of his Works that we have seen, and it is much to be regretted, that the Life of so great a Mathematician

thematician has not been taken Notice of by the voluminous Biographers, who, notwithstanding, employ whole Pages in the Lives of Persons, whose Memory will be of no more Benefit to Mankind, than their Actions were while living. History informs us, that he died in the Year 1547, in the 70th Year of his Age.

The LIFE of SEBASTIAN MUNSTER.

SEBASTIAN MUNSTER, was a German Monk, born at *Inglefham*, in the Year 1489. He appears to be so extraordinary a Person, with respect to his Knowledge of the Mathematics, and various other Branches of Literature, that we are sorry to find so little of his Birth, Education, &c. Some of the most eminent and distinguishing Characters and Events of his Life are, that from a diligent and impartial Study of the Holy Scriptures, in their original Languages, he discovered the Repugnancy of *Popish* Principles, to the Purity and Simplicity thereof, and therefore publicly renounced those Errors, and embraced Protestantism in 1529. The Proofs he gave of his Accuracy in the *Hebrew* Tongue, and his Skill in the Mathematics, intitled him to public Regard, so that he was esteemed as the *Strabo* and *Esdra*s of Germany; for he was called to the Professorship of the *Hebrew* Language at *Basil*, at the Time of his Conversion. He translated the *Hebrew* Bible, and *Josephus's* History of the *Jews* into *Latin*; he published a Grammar of the *Chaldee*, an *Hebrew* Dictionary, a large Treatise of Dialling in Folio, and a Treatise of Cosmography, which was equally learned and laborious. He died at *Basil* of the Plague, in 1552, in the 23d Year of his Professorship, and the 63d Year of his Age.

The LIFE of PETER NONIUS.

PETER NONIUS, was born at *Salutiæ*, a City and Marquisate of *Piedmont*, A. C. 1492, (under the Government of the King of *Portugal*.) He was esteemed one of the most

most learned Mathematicians of the 16th Century. He was Preceptor to Don *Henry*, Son of *Emanuel*, King of *Portugal*, and was called to the Professorship of the Mathematics in the University of *Coimbra*, where he published some Pieces which procured him great Reputation. His Book *De Arte Navigandi*, was received so much the more favourably, as it served the grand Designs projected at the Court of the King his Master; for carrying on his maritime Expeditions into the East. — Concerning this Work, Father *Dechaes* gives us the following Account. “ In the Year 1530, *Petreus Nonius*, a celebrated *Portuguese* Mathematician, upon occasion of some Doubts proposed to him by *Mortinus Alphonsus Sofa*, wrote a Treatise of Navigation, divided into two Books; in the first, he answers some of those Doubts, and explains the Nature of *Loxodromic Lines*. In the second Book, he treats of Rules and Instruments proper for Navigation, particularly Sea-Charts and Instruments, which serve to find the Elevation of the Pole, but says, this Author is somewhat obscure in the Manner of his Writing.” — *Furetiere*, in his Dictionary, takes Notice, that *Peter Nonius* was the first, who in 1530, invented the Angles which the *Loxodromic Curves* make with each Meridian, and which he calls Rhumbs in his Language, and which he calculated by spherical Triangles. *Simon Stevinus* acknowledges, that *Peter Nonius* was scarce inferior to the very greatest Mathematicians of the Age. *Schottus* says, he explained a great many Problems, and particularly the mechanical Problem of *Aristotle*, on the Motion of Vessels by Oars. His Notes upon *Purbachius*’s Theory of the Planets are very much to be esteemed; for he there explains several Things which had either not been taken Notice of, or not been rightly understood.

He published in 1542, a Treatise on the Twilight, which he dedicated to *John III.* King of *Portugal*, and added to it what *Alhazen*, an *Arabic* Author, has composed on the same Subject. He likewise corrected several mathematical Mistakes of *Orontius Finæus*. — But the most celebrated of all his Works, or that at least he appeared most to value, was his Treatise of Algebra, which he had composed in *Portuguese*, but translated into *Castilian*, when he resolved upon making it public;

public; for he considered, that the *Castilian* Language was more generally known than the *Portuguese*, and that consequently his Book would be of less Use, if he should leave it in its original Form. This Work he dedicated to his former Pupil, Prince *Henry*, the Cardinal Infant. His Epistle Dedicatory is dated from *Lisbon*, the 1st of *December*, 1564; he was then principal Cosmographer to the King of *Portugal*, and mathematical Professor in the University of *Coimbra*. This Work contains 341 Pages in the Edition of *Antwerp*, 1567, in *Octavo*.

There is a celebrated Invention, which goes by the Name of *Nonius*, and is supposed to be the Invention of this learned *Portuguese*. But in such Authors, as have given us a Sketch of his Works, they have never so much as mentioned this Article, which had it been really his Invention, they surely would never have omitted. The famous Astronomer *Ricciolus* frequently quotes this Author, but never mentions this Invention of his, though had it been known at that Time, it must certainly have answered a very good Purpose to him. But *Taquet* in his *Geometry*, Book I. takes Notice, that *Clavius* mentions this as the Contrivance of *Peter Nonius*, but represents him as delivering it in a Manner very difficult, and that it is hardly practicable. He likewise ascribes the present easy Method of using this Invention to *Guidas Ubaldus*, which is to be seen in his astronomical Problems, from whom he supposes modern Writers have borrowed it. An Account of the Use of this Instrument may be seen in *The Young Gentleman and Lady's Philosophy*, Page 336. *Nonius* died in the Year 1572, aged 80 Years, leaving behind him one Daughter. *Thuanus* mentions, that he was a PROFESSOR of PHYSIC, which we also find confirmed by other Authors.

The LIFE of PARACELSUS.

Paracelsus (*Philip Aureolus Theophrastus, Bombant de Hohenheim*) was born in 1493, at *Emsteln*, near *Zurich*, in *Switzerland*. His Father's Name was *William*, who, being the natural Son of a Prince, was well skilled in the Sciences, and took great Care in the Education of his Son. *Paracelsus*, well answered his Expectation, as he had a good natural Genius; and as his Inclination led him to the Study of *Physic*, he made great Progress in the same in a short Time. He travelled into *France*, *Spain*, and *Italy*, and the *Empire*, in order to be acquainted with the most celebrated Physicians there. After his Return into *Switzerland*, he resided for a considerable Time at the City of *Basil*, where he taught *Physic* in the *German* Tongue, (as *Ramus*, and some others inform us.) By his Affiduity in Study, and making suitable Experiments, he made great Improvement, and discovered new Methods of preparing Medicine, which was by chemical Operations, which, joined with the Success that attended his Practice of *Physic*, acquired him great Reputation. One *John Lichtenfels*, a Canon, falling extremely sick, applied to *Paracelsus*, and promised him a considerable Sum, if he could recover him. *Paracelsus* effected it; but the Other refusing to pay, was sued by him, which occasioned the Case to be laid before the Council, who ordered the Canon to pay him the usual Fee only. *Paracelsus*, enraged at this Treatment, forsook the City of *Basil*, and retired into *Alsatia*; where he likewise obtained great Reputation, as an *Alchymist*. He took Pleasure in exploding the common and ordinary Way of practising *Physic*, and gloried in having, in so great a Measure, overthrown the Method of *Galen*, which he saw was imperfect and doubtful. In Consequence hereof, however, he incurred the Displeasure of the Physicians in general; whom he is said to have treated with too much Contempt; valuing himself much on his own Improvements, or new Methods of Practice; even boasting, that he could, by his Remedies, keep a Man alive for several Ages; whereas he himself died, when but 48 Years of Age, in 1541, and was buried in the Hospital of *St. Sebastian*, where may be seen his Epitaph.

We have his Works in eleven Volumes, by the Title of *Opera Medico-Chymica; sive Paradoxa*. He wrote several other Treatises, that have not been published; which are to be found in the Closets of the Curious.

The LIFE of CONRADE GESNER.

Conrade Gesner was born at Zurich, in Swisserland. In the Year 1516, his Travels and indefatigable Studies in the Science of Physic and Philosophy rendered him famous; so that he was surnamed the *Pliny of Germany*. This great Man begun his Studies in *France*; and having finished them, travelled into *Italy*. At his Return, being chosen Professor, he applied himself particularly to explain what belonged to Nature, and Natural History, and to find out a more compendious Way of learning the Sciences than is commonly practised in most Universities. *Thuanus*, and other Historians gives him an high Encomium for his laudable Attempts, and for his laborious Lucubrations in the Prosecution of them. He died in the Year 1565, in the 49th Year of his Age. His principal Writings were as follow: His *Universal Library*; — *A natural History of Animals*, in 4 Vols. — *A Treatise of the Nature of Serpents*, in 5 Books; — *A Catalogue of Plants*; — *A Treatise of the Baths in Germany and Helvætia*; — *A Treatise of Fossils, Stones and Gems*, illustrated with Figures; — *A Greek and Latin Lexicon*, with some other Pieces of less Note.

The LIFE of PETER RAMUS.

Peter Ramus was born at *Vermandois*, in the Year 1515. History makes mention of the Meanness of his Birth, and distressing Vicissitudes of his younger Years, as such Obstacles to his great Acquirements in Philosophy and the Mathematics, as render him the more admirable. His strong Propensity to Learning, when but eight Years of Age, induced him to leave the Place of his Birth, and go to *Paris*; from whence he was driven

driven by the Violence of the Times, as *Banofius* expresses it, and though Fortune seemed every Way his Enemy, yet he returned thither again; and being inflamed with a most ardent Desire of Learning, that he might attain the liberal Arts, he contented himself with a very slender Subsistence for several Months, which he received from *Honoratus Charpentier*, his Uncle. He was afterwards reduced by Necessity to undergo a hard Service, for many Years, in the College of *Navarre*; nevertheless, as he discharged his Duty faithfully to his Masters, in the Day-time; so, in the Night, after the Example of the Philosopher *Cleanthes*, (by the Help of his Oil and his Lamp) he, in a short Time, acquired such Knowledge in the Sciences, as qualified him for an advantageous Attendance on a Course of Philosophy in the Schools for three Years and an Half; so that he merited the Esteem of the most Ingenious, and was admitted to take the Degree of Master of Arts. He engaged to maintain Sentiments, or Doctrines, quite contrary to those of *Aristotle*, then taught in the Schools.

Fregius says, “when he was about to take his Degrees, according to the Custom of the Schools, he was obliged to give the Examiners, or Professors, an Opportunity to dispute with him. He therefore advanced this Problem, that all that *Aristotle* had laid down was false. The Professors were astonished at such a Problem, and treated him with some Contempt on account of it.”

However, he answered very smartly, all the Objections that were made to him for a whole Day; and that he might do it with future Success and Advantage, he resolved to examine *Aristotle's* Doctrine more narrowly; and that he might defend his own Hypothesis, he set about perfecting himself in Logic; and made his Reading, and also his Lectures of Eloquence, subservient to it. The two first Books which he published, viz. his Institutions of Logic, and his Animadversions on *Aristotle*, occasioned great Troubles in the University of *Paris*. The Professors at *Paris*, who admired *Aristotle*, should have refuted *Ramus's* Book in their Writings and Lectures; but instead of keeping within the Bounds of an Academical War, they fell to prosecuting that *Anti-peripatetic* before the civil Magistrate, as a Man, who undermined the Foundations of Religion.

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They raised so many Clamours, that the Cause was brought before the Parliament of *Paris*; but as soon as they perceived that it would be examined equitably, they got it removed from that Tribunal by their Intrigues, and brought it before the King's Council; and it appeared highly necessary, that *Francis I.* should concern himself with it, and bring the Cause before himself, which was depending in the Parliament of *Paris*, between *Ramus* and *Anthony Goeva*. Some Judges were assigned to the Parties, and to make Report, according to the Difference between them, after they had heard them dispute; but it seemed as only intended to save Appearances, such Partiality was conspicuous in their Conduct. *Goeva* had all the Advantage he could desire; and the Books of *Ramus* were censured, and even prohibited throughout the Kingdom; and the Author was forbidden to teach Philosophy. This happened in the Year 1443, and occasioned great Joy among some of *Goeva's* Friends and Favourers of the *Aristotelian* Doctrines, which they expressed in a most public and unbecoming Manner. *Ramus* could not but behave with some Degree of Resentment for such Treatment, and said; "He hoped he should see the Time, when such Judges would not reap the same Pleasure from what they had done."——

The Year following, the Plague raged at *Paris*, and occasioned the Dispersion of the Scholars of the College of *Prele*; but *Ramus* being solicited by his Friends to teach there, had quickly a great many Hearers. The *Sorbonne* endeavoured to have him expelled from that College; but could not succeed in it. He was maintained in his Place of Principal, by a Decree of the Parliament, and the Cardinal of *Lorrain* proved so good a Patron to him, that he obtained from *Henry II.* the Liberty of writing and speaking in the Year 1547; and the Royal Professorship of Philosophy and Eloquence, in *July*, 1551. The Parliament of *Paris* had before this, maintained him in the Liberty of reading philosophical Lectures, as well as Lectures on Eloquence; and their Decree had likewise put a Stop to many Proceedings, that might otherwise have proved greatly injurious to him. He was no sooner made *Regius Professor*, but he shewed a new Desire of investigating, and perfecting the Sciences, and pursued it with indefatigable Industry, notwithstanding

standing the restless, inveterate Spirit, that appeared in his Enemies, in some Measure, obstructed his public Usefulness. Some endeavoured to bring a Persecution against him and his Colleagues for a wrong Pronunciation of the Letter Q. They carried their Attempts so far, that he was obliged for a while to abscond. He went to *Fontainebleau* with the King's Leave. *Fregius* says, "He would have investigated many Mysteries in Geometry in a few Months, if his Career had not been stopped by a fatal Calamity; but having obtained the King's Letters, he retired to the Royal Library at *Fontainebleau*, where he more fully revised and examined the Mathematical Lectures he had formerly read:——But when it came to be known that he was there, he did not think himself safe, and was forced to abscond. He therefore thought of going to *Italy*; whither *Bologna* had given him a most honourable Invitation. He often turned his Eyes towards *Germany*: That was most dear to him; from the Love he bore to Mathematical Studies, and the superior Liberty which was enjoyed there with respect to Religion. But, on the other Hand, Nothing surrounded him but Terrors, and the Apprehensions of Death. The Intelligence he received, that the College of *Prele* was cruelly sacked, and that his Library was plundered, and stripped of every Thing valuable, brought him back to the Castle of *Vincennes*, nearer the Town. But in 1563, the Peace being concluded between *Charles IX.* and the *Protestants*, he was again restored to his Place; wherein, he maintained himself with great Vigour, and endeavoured chiefly to make mathematical Learning flourish; which he did 'till the second Civil War, in the Year 1567. He was then obliged to leave *Paris*, and put himself under the Protection of the *Hugonots*.

He was in their Army at the Battle of *St. Denys*. The Peace was made in a little Time after, and he was again established in his Professorship; but foreseeing that the War would soon break out again, and being unwilling to be exposed to the same Difficulties, he asked the King's Leave to go, and see the *German* Universities, which was granted him. He made that Journey in the Year 1568, where he was received, and treated with great Honour and Esteem. He returned into *France*, after the third War, and met an untimely Fate, in the

general Massacre of the Protestants at *Paris*, on *St. Bartholomew's-day*, 1571, as may be seen in the Passage, which *Moreri* has transcribed from *Thuanus*.

He was, without Doubt, a great Orator, according to the Testimony of *Brantome*, in the following Words. “ *Ramus* was a most eloquent Orator, and there have been few like him; for his Eloquence was attended with an extraordinary graceful Delivery, which he displayed on all Occasions; especially, in Defence of the *Hugonots*, as a Sect, and in favour of his peculiar Tenets in Religion or Philosophy. He was free from Avarice, as is evident from his refusing some Professorships, which might have been very profitable to him; but chose rather to be a Teacher in the College of *Prele*, where he had no public Salary. He would not accept the Presents that his Pupils were desirous to make him, and maintained some Scholars at his own Charge. Whenever he went into his own Country, it was his principal Delight to assist such poor Children as appeared to him of a promising Genius: Some of them he placed in the College of *Prele*, where he instructed them, and provided for their further Improvement. He refused to go into *Poland*, though he was promised to be well rewarded for the Encomium he should bestow upon the Duke of *Anjou*. His Answer was, “ That Eloquence ought not to be a mercenary Thing; and that an Orator ought to be a Man of Probity:— He was remarkably sober, chaste and temperate, habituating himself to an Austerity of Conduct, rather than any Kinds of Indulgence. He rose early, and studied much; and though he lived a single Life, was never so much as suspected of the Breach of Chastity. He was conscientiously zealous for the reformed Religion. Some censure him as obstinate in this Particular; but he bore all the Misfortunes which he incurred on these Accounts with a remarkable Firmness and Magnanimity.

—— About three Years before his Decease, he made his last Will, wherein he ordered 500 Livres should be applied for the Salary of a Professor, for teaching the Astronomical, Optical, Mechanical, and Geographical Sciences, in the Royal College

—— He discovered a great Desire to alter and regulate the Discipline of the reformed Churches; but in this, his Design was frustrated, by the Proceedings of a national Synod. These

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The Life of John-Anthony Maginus. 511

are the most remarkable, authentic Circumstances in his Character. His Writings farther illustrate his Merit ; a Catálogue of which, according to Mons. Bayle, may be seen in Mr. T^eissier's *Addition to the Eulogies*, Tom. i. p. 273.

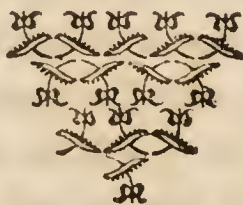
The LIFE of JOHN - ANTHONY MAGINUS.

JOHN-ANTHONY MAGINUS, Professor of Mathematics in the University at *Bologna*, was born at *Padua*, a City in *Italy*, in the Year 1536. This Person, we find, was remarkable for his great Assiduity in the Acquirement and Improvement of Knowledge in the mathematical Sciences, and several new Inventions for these Purposes, and for the extraordinary Favour he obtained with all the Princes of his Time. He was addicted to making Horoscopes, and such like Instruments ; and was invited by the Emperor *Rodolphus* to come to *Vienna*, where he promised him a Professor's Chair, about the Year 1597 ; but not being able to prevail on him to settle there, he nevertheless honoured him with a generous Pension.

It is said, that he was so much addicted to astrological Predictions, that he not only foretold many good and evil Events relative to Others with Success ; but even foretold his own Death, which came to pass that same Year : But whenever he foretold any Events, he flattered None. Whilst he foretold to One a Cardinal's Cap, or an honourable Employ, he forewarned Others of Accidents, Banishment, and Afflictions: These he always represented as under the Influence of the Stars. This, Authors have attempted to account for, in some Measure, as a Prepossession generally attending that Age, that few could allow themselves to question the Truth of it, or had Courage to oppose it. With respect to this Author's foretelling his own Death, (in which he was not much mistaken in Time, or Manner) 'tis observed, that he was very fat and burly, and therefore foretold his dying suddenly. *Tomasini* says,

says, that *Maginus*, being advanced to his 61st Year, was struck with an Apoplexy, which ended his Days; and that a long while before, he had told Him and Others, that he was afraid of that Year. But at the same Time acknowledges, that he lived near eight Months afterwards. It ought not therefore to have been alledged, as an Argument of the astrological Skill of *Maginus*, that he found such Malignities in his Nativity, with regard to his 61st Year.——*John-Anthony Rosfenus*, taking more Care of his Master, only said, that *Maginus* died under an Aspect of the Planets, which, according to his own Prediction, would prove fatal to him, and mentions *Ricciolus*, as affirming, that he had said, the Figure of his Nativity, and his climacterical Year condemned him to die about that Time, which happened in the 62d Year of his Age, 1618, he left behind him a Son and a Daughter.

His Writings do Honour to his Memory, as they were very considerable, and upon learned Subjects; the Principal were the following: First, his *Ephemerides*, in 3 Vols. from the Year 1580, to 1630.——2d, His *Tables of secondary Motions*.——3d, *Astronomical, Gnomonical, and Geographical Problems*.——4th, *A Theory of the Planets, according to Copernicus*.——5th, *A Confutation of Scaliger's Dissertation concerning the Procession of the Equinox*.——6th, *A Primum Mobile*, in 12 Books.——7th, *A Treatise of Plain and Spherical Trigonometry*.——8th, *A Commentary on Ptolemy's Geography*.——9th, *A Chorographical Description of the Regions and Cities of Italy*, illustrated with 60 Maps, with some other Writings on astrological Subjects, which by all Means ought to be buried in oblivion.



The LIFE of GERRARD MERCATOR.

Gerrard Mercator was born at *Ruremond* in the Low Countries, A. C. 1512. History remarks his indefatigable Industry in acquiring Knowledge in the Sciences of *Geography* and *Mathematics*; so that he neglected, to a Fault, Eating and Sleeping. He composed a *Chronology*, a greater and lesser *Atlas*, and some *Geographical Tables*, besides other Books in Philosophy and Divinity; and was so curious as well as ingenious, that he coloured his Maps, and what is very considerable, that he engraved himself a celestial and terrestrial Globe, and made many other mathematical Instruments for the Use of the Emperor *Charles V*; and gave the most ample Proofs of his uncommon Skill in what he professed. He died in 1594, aged 82 Years.

The LIFE of JOHN DEE.

JOHN DEE, a very considerable Mathematician, was born about the Year 1522. He published many Things in the mathematical Way; among others, he wrote useful Comments on *Euclid's Elements*, translated by *Billingfley*; to which he prefixed a very large Preface, describing the several Arts and Sciences, in which *Euclid's Elements* are of necessary Use. He was somewhat addicted to *Astrology*, which is to be wondered at in so eminent a Mathematician. His Character was so great, from a general Knowledge of the Sciences, as occasioned him a great Number of Enemies and Calumniators; of which he grievously complained in the above-mentioned Preface; for, having been speaking of the great Things that had been done by the *Thaumaturgic Art*, he has these Words: "And for these, and such like marvellous Acts and Feats, naturally, mechanically, and mathematically made and contrived, ought any honest Student and modest Christian Philosopher to be accounted and called a Conjuror? Shall the Folly of Idiots and the Malice of the Scornful so much prevail, that he, who seeketh no worldly Gain or Glory, be
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condemned as a Madman, and injurious to the Public, with a great Deal more to the same Purpose. The Conclusion of his Preface is ; *Written at my poor House, at Mortlack, Feb. 9, 1570.*

The LIFE of JOHN KEPLER.

JOHAN KEPLER, born at Wertemberg, in Germany, about the Year 1530, was the Disciple of *Mæstlinus*, a very great Mathematician and Astronomer, and of whom he learned the mathematical Arts, and became Professor of those Sciences to three Emperors, viz. *Matthias*, *Rudolphus*, and *Ferdinand II.* He was a Man of a most acute Genius, and a most subtle Enquirer into astronomical Matters. To this sagacious Philosopher we owe the first Discovery of the great Laws of the planetary Motions; viz. *that the Planets describe Aries, proportioned to the Times; and that the Squares of the periodical Times were proportioned to the Cubes of their Distances:* And these are universally now known by the Name of *Kepler's Laws.* But as this Man makes the greatest Figure, and stands at the Head of the astronomical Class, we think it highly worthy to give an Account of him at large, which we shall do in the Words of that great Mathematician Mr. *Maclaurin.*

KEPLER had a particular Passion for finding Analogies and Harmonies in Nature, after the Manner of the *Pythagoreans* and *Platonists*; and to this Disposition we owe such valuable Discoveries as are more than sufficient to excuse his Conceits. Three Things, he tells us, he anxiously sought to find the Reason of, from his early Youth; why the Planets were fix'd in Number, why the Dimensions of their Orbits were such as *Copernicus* had described from Observations, and what was the Analogy, or Law of their Revolutions. He sought for the Reasons of the first two of these in the Properties of Numbers and plane Figures, without Success. But at length reflecting, that while the plane regular Figures may be infinite in Number, the ordinate and regular Solids are five only, as *Euclid* had long ago demonstrated; he imagined, that certain Mysteries in Nature might correspond with this remarkable Limitation inherent

rent in the Essences of Things ; the rather, that he found the *Pythagoreans* had made great Use of those five regular Solids in their Philosophy. He therefore endeavoured to find some Relation between the Dimensions of those Solids and the Intervals of the planetary Spheres ; and imagining that a Cube, inscribed in the Sphere of *Saturn*, would touch by its six Planes the Sphere of *Jupiter*, and that the other four regular Solids in like Manner fitted the Intervals that are betwixt the Spheres of the other Planets, he became persuaded that this was the true Reason why the primary Planets were precisely six in Number, and that the Author of the World had determined their Distances from the Sun, the Center of the System, from a Regard to this Analogy. Being thus possessed, as he thought, of the grand Secret of the *Pythagoreans*, and being mightily pleased with his Discovery, he published it in 1596, under the Title of *Mysterium Cosmographicum*.

KEPLER sent a Copy of this Book to *Tycho Brahe*, who did not approve of those abstracted Speculations concerning the System of the World, but wrote to *Kepler*, first to lay a solid Foundation in Observations, and then, by ascending from them, to strive to come at the Causes of Things. This excellent Advice, to which we owe the more solid Discoveries of *Kepler*, deserves to be copied from his own Account of it. “ *Argumentum literarum Brachei* (says he) *hoc erat ; uti suspensis speculationibus a priori descendentibus, animum potius ad observationes, quas simul offerebat, considerandas adjicerem. Inque iis primo gradu facto, post demum, ad causas ascenderem.*” In this Judgment the great Men of different Times have frequently conspired, but few have faithfully followed it.

TYCHO, however, pleased with his Genius, prevailed with *Kepler* to reside with him near *Prague* (where he passed the last Years of his Life, after having left his native Country on some ill Usage) and to assist him in his astronomical Labours. Soon after this *Tycho* died, but *Kepler* made many important Discoveries from his Observations : He found that Astronomers had erred, from the first Rise of the Science, in ascribing always circular Orbits and uniform Motions to the Planets ; that each of them moves in an Ellipsis, which has one of its *Foci* in the Center of the Sun ; that the Motion of each is really unequal;

ble; and varies so, that a Ray supposed to be always drawn from the Planet to the Sun describes equal Areas in equal Times.

It was some Years later before he discovered the Analogy there is between the Distances of the several Planets from the Sun, and the Periods in which they compleat their Revolutions. He easily saw, that the higher Planets not only moved in greater Circles, but also more slowly than the nearer ones; so that, on a double Account, their periodic Times were greater; *Saturn*, for Example, revolves at a Distance from the Sun nine Times and a Half greater than the Earth's Distance from it; and the Circle described by *Saturn* is in the same Proportion; and as the Earth revolves in one Year, so, if their Velocities were equal, *Saturn* ought to revolve in nine Years and a Half; whereas the periodic Time of *Saturn* is above Twenty-nine Years. The periodic Times of the Planets increase, therefore, in a greater Proportion than their Distances from the Sun; but not in so great a Proportion as the Squares of those Distances; for if that was the Law of the Motions (the Square of $9\frac{1}{2}$ being $90\frac{1}{4}$) the periodic Time of *Saturn* ought to be above 90 Years. A mean Proportion betwixt that of the Distances of the Planets, and that of the Squares of those Distances, is the true Proportion of the periodic Times; as the Mean betwixt $9\frac{1}{2}$ and its Square $90\frac{1}{4}$ gives the periodic Time of *Saturn* in Years. *Kepler*, after having committed several Mistakes in determining this Analogy, hit upon it at last in 1618, May 15th; for he is so exact as to mention the precise Day when he found, that "The Squares of the periodic Times were always in the same Proportion as the Cubes of their mean Distances from the Sun." This is only a very brief and summary Account of the Fruits of his great Labours for many Years on the Observations made by *Tycho*.

When *Kepler* saw that his Disposition of the five regular Solids amongst the planetary Spheres was not agreeable to the Intervals between their Orbits, according to better Observations, he endeavoured to discover other Schemes of Harmony. For this Purpose, he compared the Motions of the same Planet at its greatest and least Distances, and of the different Planets in their several Orbits, as they would appear viewed from the Sun; and

and here he fancied that he found a Similitude to the Divisions of the Octave in Music. These were the Dreams of this ingenious Man, of which he was so fond, that, hearing of the Discovery of four new Planets (the Satellites of *Jupiter*) by *Galileo*, he owns that his first Reflexions were from a Concern how he could save his favourite Scheme, which was threatened by this Addition to the Number of the Planets. The same Attachment led him into a wrong Judgment of the Sphere of the fixed Stars: For being obliged, by his Doctrine, to allow a vast Superiority to the Sun in the Universe, he restrains the fixed Stars within very narrow Limits. Nor did he consider them as Suns, placed in the Centers of their several Systems, having Planets revolving round them; as the other Followers of *Copernicus*, from their having Light in themselves, their immense Distances, and from the Analogy of Nature, have concluded them to be. Not contented with these Harmonies, which he had learned from the Observations of *Tycho*, he gave himself the Liberty to imagine several other Analogies, that have no Foundation in Nature, and are overthrown by the best Observations. Thus from the Opinions of *Kepler*, tho' most justly admired, we are taught the Danger of espousing Principles, or Hypotheses, borrowed from abstracted Sciences, and of applying them, with such Liberty, to natural Enquiries.

A more recent Instance of this Fondness, for discovering Analogies between Matters of abstracted Speculation and the Constitution of Nature, we find in *Huygens*, one of the greatest Geometricians and Astronomers any Age has produced: When he had discovered that Satellite of *Saturn*, which, from him, is still called the *Huygenian* Satellite, this, with our Moon, and the four Satellites of *Jupiter*, completed the Number of six secondary Planets then discovered in the System: And, because the Number of the primary Planets is also six, and this Number is called by Mathematicians a perfect Number, (being equal to the Sum of its aliquot Parts, 1, 2, and 3,) *Huygens* was hence induced to believe that the Number of the Planets was complete, and that it was in vain to look for any more. We do not mention this to lessen this great Man, who never perhaps reasoned in such a Manner on any other Occasion; but only to shew, by another Instance, how ill-grounded Rea-

sonings of this Kind have always proved: For, not long after, the celebrated *Cassini* discovered four more Satellites about *Saturn*, so that the Number of secondary Planets now known in the System is ten. The same *Cassini* having found that the Analogy, discovered by *Kepler*, between the periodic Times and the Distances from the Center, takes Place in the lesser Systems of *Jupiter* and *Saturn*, as well as in the great solar System; his Observations overturned that groundless Analogy which had been imagined between the Number of the Planets, both primary and secondary, and the Number six; but established, at the same Time, that Harmony in their Motions, which will, afterwards, appear to flow from one real Principle extended over the Universe.

But to return to *Kepler*, his great Sagacity, and continual Meditation on the planetary Motions, suggested to him some Views of the true Principles from which these Motions flow. In his Preface to the Commentaries concerning the Planet *Mars*, he speaks of Gravity as of a Power that was mutual betwixt Bodies, and tells us, that the Earth and Moon tend towards each other, and would meet in a Point so many Times nearer to the Earth than to the Moon, as the Earth is greater than the Moon, if their Motions did not hinder it. He adds, that the Tides arise from the Gravity of the Waters towards the Moon. But not having just enough Notions of the Laws of Motion, he does not seem to have been able to make the best Use of these Thoughts; nor does he appear to have adhered to them steadily, since in his *Epitome* of Astronomy, published eleven Years after, he proposes a physical Account of the planetary Motions, derived from different Principles.

He supposes, in that Treatise, that the Motion of the Sun on his Axis is preserved by some inherent vital Principle; that a certain Virtue, or immaterial Image of the Sun, is diffused with his Rays into the ambient Spaces, and, revolving with the Body of the Sun on his Axis, takes hold of the Planets and carries them along with it in the same Direction; as a Loadstone turned round in the Neighbourhood of a magnetic Needle makes it turn round at the same Time. The Planet, according to him, by its *Inertia* endeavours to continue in its Place, and the Action of the Sun's Image and this *Inertia* are in a perpetual

Struggle.

Struggle. He adds, that this Action of the Sun, like to his Light, decreases as the Distance increases; and therefore moves the same Planet with greater Celerity when nearer the Sun, than at a greater Distance. To account for the Planet's approaching towards the Sun as it descends from the *Aphelium* to the *Perihelium*, and receding from the Sun while it ascends to the *Aphelium* again, he supposes that the Sun attracts one Part of each Planet, and repels the opposite Part; and that the Part which is attracted is turned towards the Sun in the Descent, and that the other Part is towards the Sun in the Ascent. By Suppositions of this Kind, he endeavoured to account for all the other Varieties of the celestial Motions.

Now the Laws of Motion are better known than in *Kepler's* Time, it is easy to shew the Fallacy of every Part of this Account of the planetary Revolutions. The Planet does not endeavour to stop in its Place in consequence of its *Inertia*, but to persevere in its Motion in a right Line. An attractive Force makes it descend from the *Aphelium* to the *Perihelium* in a Curve concave towards the Sun; But the repelling Force, which he supposed to begin at the *Perihelium*, would cause it to ascend in a Figure convex towards the Sun. We shall have occasion to shew afterwards, from Sir *Isaac Newton*, how an Attraction or Gravitation towards the Sun, alone, produces the Effects, which, according to *Kepler*, required both an attractive and repelling Force; and that the Virtue which he ascribed to the Sun's Image, propagated into the planetary Regions, is unnecessary, as it could be of no Use for this Effect, tho' it were admitted. For now his own Prophecy, with which he concludes his Book, is verified; where he tells us, that "The Discovery of such Things was reserved for the succeeding Age, when the Author of Nature would be pleased to reveal those Mysteries."

The Works of this celebrated Author are many and valuable; as

1. His *Cosmographical Mystery*, in 1596.
2. *Optical Astronomy*, in 1604.
3. His Account of a new Star in *Sagittarius*, 1605.
4. His *New Astronomy*; or, *Cælestial Physics*, in Commentaries on the Planet *Mars*.

5. *Dis-*

5. *Dissertations*; with his *Nuncius Siderius* of Galileó, in 1610.

6. His *New Ephemerides*, from 1617, to 1620.

7. His three first Books of the *Copernican Astronomy*, in 1618.

8. His *Harmony of the World*, and three Books of *Comets*, in 1619.

9. His *Cosmographical Mystery*, 2d Edition, with Notes, in 1621.

10. The three last Books of his *Copernican Astronomy*, in 1622.

11. His *Astronomical Tables* (called the *Rudolphine Tables*) in Honour of the Empéror *Rudolphus*, his great and learned Patron, in the Year 1627: Besides these, he wrote several Things in *Chronology*, the *Geometry of Solids*, *Trigonometry*, *Logarithms*, and an excellent Treatise of *Dioptrics* for that Time.

His Death was universally regretted by the learned World, but the Time of it is not certain.

The LIFE of CHRISTOPHER CLAVIUS.

CHRISTOPHER CLAVIUS, a German Jesuit, born A. C. 1537, at Bamberg, was famous for his Knowledge in the Mathematics; and one, who distinguished himself in the Correction of the Calendar, of which he afterwards undertook a Defence: But notwithstanding his being allowed by many to be an Adept in the Sciences of *Geometry* and *Astronomy*, his Works were differently represented, and his Merit, as an Author, set in very different Points of Light by his Contemporaries and Successors. He is allowed by all, to have applied himself with great Assiduity to the Knowledge of those Sciences, and that for fifty Years; in which Time, he made it his Care to illustrate the most difficult and important Propositions in *Euclid*; which he published with large Annotations in two Volumes 8vo. But whether through an Ambiguity in the Manner of conveying his Ideas, or their peculiar Interest clashing with each other, we find *Scaliger* very forward to censure his Judgment and Skill in those very Branches of Literature. Others, in like Man-

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The Life of JOHN BAPTISTA PORTA. 221

ner attribute a great Degree of Modesty and Humility to *Clavius*; while others intimate, that he was so sensible of the Acquirements and Proficiency which he had made, as to value himself upon it, and be very tenacious of his Honour, on this Account. *Alegcombe* gives him this Character: “ Though no Man, says he, was ever more remarkable for his Piety and Learning; yet his Modesty was such, that he preferred all Men before himself.” The Manner of his Death is said to be lingering; and it is mentioned by one Historian, that he died at *Rome*, laden with Years and Merit, on the 6th of *February*, in the Year 1612, aged 75 Years.

The LIFE of JOHN BAPTISTA PORTA.

Baptista de la Porta, known by the Name of *Giovan Baptista de la Porta*, of *Naples*, lived about the End of the 16th Century, famous not only for his Skill in Philosophy, Mathematics, Physic, &c. but for his indefatigable Endeavours, to improve and propagate the Knowledge of those Sciences, for which he not only established private Schools for particular Sciences, but to the utmost of his Power, promoted public Academies. He had no small Hand in establishing the Academy at *Gli Ozioni*, at *Naples*, and had one in his House, called *de Secreti*, whereunto none were admitted, but such who had made some new Discoveries in Nature. His Works were many, and gave the fullest Proof of an extensive Genius: The Principal of which are as follow.

I. His *Natural Magic*, a Book abounding with curious Experiments; but contains nothing of Magic, in the common Acceptation of the Word, as he pretends to nothing above the Power of Nature.

II. *Elements of Curved Lines.*

III. *A Treatise of Distillation.*

IV. *A Treatise of Arithmetic.*

V. *Concerning the secret Notes, or Marks of Letters.*

VI. *Of optical Refractions.*

VII. *A Treatise of Fortification.*

VIII. *A Treatise of Physiognomy*; with other Pieces of less Note, and some Plays. He died at *Pisa*, in the Kingdom of *Naples*, in 1615; but we meet with no particular Account of the Manner of his Death.

The LIFE of Sir FRANCIS BACON.

FRANCIS BACON, Viscount of *St. Alban's*, and High-Chancellor of *England*, in the Reign of King *James the Ist*, descended from Sir *Nicholas Bacon*, Lord-Keeper of the Great Seal, and his Mother *Anne*, one of the Daughters of Sir *Anthony Cook*, Tutor to King *Edward VI.* a Lady equally distinguished by her Piety, Prudence and Learning. She was the second Wife of Sir *Nicholas Bacon*; and this *Francis*, her second Son, was born at *York-House* in the *Strand*, on the 22d of *January*, 1561. His Infancy being past, and his noble Genius being cultivated and encouraged by his excellent Parents, gave early Proofs of its surprising Strength and Pregnancy; insomuch that, we may justly say, his Fame commenced with his Childhood, and accompanied him to his Grave; for so remarkably conspicuous were his Parts, even in his tender Years, that Persons of great Worth and high Dignity delighted in conversing with him, while a Boy; and Queen *Elizabeth* herself was so charmed with the Solidity of his Sense, and the Gravity of his Behaviour, that she would often call him her young *Lord-Keeper*; a happy Prefage! which in the succeeding Reign was fully accomplished. When he had acquired the necessary Rudiments of Learning, to qualify him for academical Studies, he was sent to the University of *Cambridge*, where, on the 16th of *June*, 1573, he was entered of *Trinity College*, under Dr. *John Whitgift*, afterwards Archbishop of *Canterbury*, being then in the 12th Year of his Age. The Quickness of his natural Parts, assisted by an uncommon Diligence and Application, under the Direction of as able and careful a Tutor, as any that learned Age afforded, enabled our young Scholar to make a surprising Progress in his Studies, insomuch that, before he was full 16 Years of Age, he had not only run through

through the whole Circle of the liberal Arts, as they were then taught, but began to perceive those Imperfections in the reigning Philosophy, which he afterwards so effectually exposed, and thereby not only overturned that Tyranny, which prevented the Progress of true Knowledge, but laid the Foundation of that free and useful Philosophy, which has since produced so many great and glorious Discoveries. His Father, the Lord-Keeper, discovering in his Son such a Ripeness of Judgment and Discretion, resolved to send him, young as he was, to *France*, that he might improve himself in the Knowledge of the World, under a Minister, as capable and as honest as that Age produced, Sir *Amias Powlet*, then the Queen's Ambassador at *Paris*. His Behaviour, while in the House of that famous Statesman, was so well conducted, that he gained the Esteem and Confidence of Sir *Amias* to such a Degree, as to be entrusted with a Commission of Importance to the Queen, which required both Secrecy and Dispatch, and was executed with great Applause. He afterwards returned to *Paris*, and visited several Provinces, the better to acquaint himself with the Country, and to improve his Knowledge of Men and Things, for which he was so peculiarly qualified and disposed. But it was not long before the Progress of his Travels and Improvements abroad received a sudden Check by the Death of his Father, the Lord-Keeper, before any Provision was made for his Support in Life, suitable to his Character and Dignity, tho' it was evidently intended. He thereupon returned Home, and applied himself to the Study of the common Law, and for that Purpose entered himself of the Honourable Society of *Gray's-Inn*, where his superior Talents rendered him the Ornament of the House, and the Gentleness and Affability of his Deportment procured him the Affection of all its Members. He spent his Time, during the first Years of his Residence there, in very hard Study, not confining himself entirely to the Law, but indulging his extensive Genius, in the free Contemplation of the whole Circle of Science. This appears clearly from hence, that he framed, (as he himself tells us) not long after his being settled here, the Plan of that great philosophical Work, which will not only render his Name immortal, but do Honour to his Age and Country. 'Tis this Part of his Character

racter and Writing, which falls under our Notice; nevertheless, that we may give a more impartial History of him, we shall briefly enter upon the Memoirs of this noble Author, as a Statesman and Politician, in which he discovered his superior Talents, by his Speeches, Writings, &c. He was appointed one of the Queen's Council, when he was but 28 Years of Age. In the last ten Years of the Queen's Reign, he made a great Figure in the House of Commons, and there he applied himself to Politics; for the Queen and Lord Treasurer *Burleigh* employed his Head and Hands in Matters of State. He was then, in his younger Years, attached to the Interest of the Earl of *Essex*, whom he endeavoured to dissuade from those rash Measures which proved his Ruin. Upon the Accession of King *James*, he was soon raised to considerable Honours. In the first Year of his Reign, he was knighted at *Whitehall*, and next Year was made one of the King's Council learned in the Law, and wrote in favour of the Union of the two Kingdoms of *Scotland* and *England*, which the King so passionately desired. In 1607, he was appointed Solicitor General. In 1611, he was made joint Judge with Sir *Thomas Vavasor*, then Knight-Marshal of the Knight-Marshal's Court, then lately erected, within the Verge of the King's House. And in 1613, he succeeded Sir *Henry Hobart*, as Attorney-General. In 1616, he was sworn one of the Privy-Council. He then applied himself to the reducing and recomposing the Laws of *England*: He distinguished himself, when Attorney-General, by his Endeavours to restrain the Custom of Duels, then very frequent. In 1617, he was appointed Keeper of the Great Seal. In 1618, he was made Lord Chancellor of *England*, and created Lord *Verulam*: But in the Midst of these Honours and Applauses, he forgot not his favourite Study of Philosophy, as we learn from several of his Letters. In *January* 27, 1621, he was advanced to the Dignity of Viscount St. *Alban's*, and appeared with the greatest Splendour at the Evening of the Session of Parliament, in the 30th of that Month: But he was soon after surpris'd with a Reverse of Fortune; for, about the 12th of *March* following, a Committee of the House of Commons was appointed to inspect the Abuses of the Courts of Justice. The first Thing they fell upon was, Bribery and Corruption,

ruption, of which the Lord Chancellor was accused by *Aubery* and *Egerton*, who affirmed, that they had procured Money to be given him, to promote their Causes depending before him. On *Monday, April 29*, he sent his Confession and Submission to the House of Lords, in which he confessed some Facts, denied some, and palliated others. The Lords agreed to sequester the Seal; and on *May the 3d*, the Lords pronounced the following Sentence, “ That the Lord Chancellor should undergo
“ the Fine of 40,000 *l.* and be imprisoned in the Tower during the King’s Pleasure; that he should be for ever incapable of any Office, Place, or Employment in the State,
“ and never sit in Parliament, or come within the Verge of the Court.” There are various Opinions concerning his Guilt of the Points charged against him. However, he retired after a short Confinement, from the Engagements of an active Life, to that of a contemplative one; and it appears from the Works he there wrote, that he spent the remaining Part of his Life, which was about five Years, in close Study; when he wrote the greatest Part of his *Latin Works* on Philosophical and other Subjects; in some of which, he discovered an humble Consciousness of his own Weakness and Imperfection. The severe Winter, which followed the infectious Summer of 1625, brought him very low; but the Spring reviving his Spirits, he made a little Excursion into the Country, in order to try some Experiments in Natural Philosophy; in which Journey he was taken so ill, that he was obliged to stay at the Earl of *Arundel’s* House, at *Highgate*, about a Week, and there he expired on the Ninth of *April, 1626*, being *Easter-day*, and was privately buried in the Chapel of *St. Michael’s* Church, within the Precincts of *Old Verulam*; in the Chancel of which Church, his faithful Friend and indefatigable Servant in his Troubles, *Sir Thomas Meautys*, caused a neat Monument of white Marble to be erected, with his Lordship’s Effigies, sitting in a contemplative Posture; with an Inscription, written by *Sir Henry Wotton*. The most eminent Scholars at the University shewed their Concern for his Death, and the just Sense they had of the Honour resulting to that noble Seminary of Learning, from his receiving his Education there, by composing Verses in several Languages on that Occasion, which

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were afterwards printed. The same Justice Posterity has also rendered to his Memory, insomuch that, it may be truly said, his own Prophecy has been fulfilled ; and that, after flying through foreign Countries for a Time, his Reputation now stands fixed at Home, where all admire the Strength and Beauty of his Genius, and, in Favour of its Efforts, would willingly forget that a Man so endowed, was not altogether exempt from Failings.

The above is a short historical Account of Sir *Francis Bacon*, as we find it in the general Writers of his Life ; but the excellent Reflections of the judicious Mr. *Mac Laurin*, on this Author and his Writings, claim every curious Reader's Notice and Attention, which we shall therefore give in his own Words, as follows :

Sir *Francis Bacon* Lord *Verulam*, who was Cotemporary with *Galileo* and *Kepler*, is justly held amongst the Restorers of true Learning, but more especially the Founder of *experimental Philosophy*. When he was but 16 Years old, he began to dislike the vulgar Physics, and what was called *Aristotle's* Philosophy. He saw there was a Necessity for a thorough Reformation in the Way of treating natural Knowledge, and that all Theory was to be laid aside that was not founded on Experiment. He proposed his Plan in his *Instauratio Magna*, with so much Strength of Argument, and so just a Zeal, as renders that admirable Work the Delight of all who have a Taste for solid Learning.

He considers natural Philosophy as a vast Pyramid, that ought to have the History of Nature for its Basis ; an Account of the Powers and Principles that operate in Nature, which he calls the physical Part, for its second Stage ; and the metaphysical Part, that treats of the formal and final Causes of Things, for its third Stage. But as for the Summit of this Pyramid, the Supreme of Nature, *opus quod operatur Deus a principio usque ad finem*, as he expresses it, he doubts if Men can ever attain to the full Knowledge of it. The Philosophers who strive to erect these by the Force of abstract Speculation, he compares to the Giants of old, who, according to the Poets, endeavoured to throw Mount *Ossa* upon *Pelion*, and *Olympus* upon *Ossa*.

An Artist, says this noble Author, would expose himself to the justest Ridicule, who, in order to raise some vast Obelisk, should attempt it by the Force of his Arms, instead of employing the proper Machines; or, if after finding himself unequal to the Task, he should call for the Aid of more Workmen in the same Way. Would he appear less ridiculous, if he should next set about chusing his Men, and examining them carefully, that he might employ the Vigorous and Robust only? Or, if after he found this was to no Purpose, he should then apply himself to study the athletic Art, and learn to compose curious Ointments for strengthening their Limbs, or consult learned Physicians, who, by proper Medicaments, should promote their Health and Vigour? Nor are they less absurd, in our noble Author's Judgment, who labour to interpret Nature by the Force and Subtlety of Genius only, tho' they should assume the Aid of the acutest Men in the same Work, and carry the Dialectics, or the Art of Reasoning, to the greatest Height for this Purpose.

The *empirical* Philosophers, those who have no higher View, than to collect the History of Nature, he compares to the Ants, who gather the Grain and lay it up as they find it; (unless it be true, as is reported of them, that they first take Care it should not germinate or become fruitful;) the *Sophists* to the Spiders, who form their Webs from their own Bowels, to catch unwary Insects in their aerial Flights; while the Bee that gathers the Matter from the Flowers of the Field, from which, with admirable Skill she makes her Honey, is the Emblem of the true Philosopher; who neither trusts wholly to his own Understanding, nor contents himself with recording the Matter with which he is furnished from natural History or mechanical Experiments; but, by reasoning skilfully from them, brings forth Truth and Science, the great and noble Production of the human Faculties. From the Neglect of Experiments it arose, that while Nature was infinite, natural Knowledge was at a Stand for many Ages, and that the various Sects wandered in the Dark, without kindling any Light to guide them, or finding any Path to conduct them in her Mazes. But, from a happy Conjunction of the experimental and rational Faculties, Lord *Verulam* conceived the highest Expectations. *Alexander*, he tells

tells us, and *Cæsar* performed Exploits that are truly greater than those reported of King *Arthur*, or *Amadis de Gaul*; tho' they acted by natural Means, without the Aid of Magic or Prodigy.

It was with great Justice, and very seasonably, he reprehended those *, who, “ upon a weak Conceit of Sobriety, or
“ ill-applied Moderation, thought or maintained that a Man
“ can search too far, or be too well studied in the Book of
“ God’s Word, or in the Book of God’s Works. But rather,
“ he adds, let Men awake themselves, and chearfully endeavour
“ your and pursue an endless Progress and Proficiency in both;
“ only let them beware lest they apply Knowledge to Pride,
“ not to Charity, to Ostentation, not to Use.” He observes, that a superficial Taste of Philosophy may perchance incline the Mind to Atheism; but a full Draught thereof brings it back again to Religion: In the Entrance of Philosophy, when the second Causes most obvious to the Senses offer themselves to the Mind, we are apt to cleave unto them, and dwell too much upon them, so as to forget what is superior in Nature. But when we pass further, and behold the Dependency, Continuation and Confederacy of Causes, and the Works of Providence, then, according to the Allegory of the Poets, we easily believe that the highest Link of Nature’s Chain must needs be tied to the Foot of *Jupiter’s* Chair; or perceive, “ That Philosophy,
“ like *Jacob’s* Vision, discovers to us a Ladder, whose Top
“ reaches up to the Footstool of the Throne of God.”

The *Aristotelian* Philosophy appeared unsatisfactory to Lord *Bacon*, not from want of Esteem for its Author, whom he always used to extol; but because it seemed fit for Disputes only, and incapable of producing real Fruit. *Aristotle*, he said, had suited his Physics to his Logic, instead of giving such a Kind of Logic as might be of real Use in Physics. To supply this Defect, he composed his *Novum Organum*; where his chief Design is to shew how to make a good *Induction*, as *Aristotle’s* was to teach how to make a good *Syllogism*. Had the Philosophers, since Lord *Verulam’s* Time, adhered more closely to his Plan, their Success had been greater; and Sir *Isaac Newton’s* Philosophy

* *Bacon’s* Advancement of Learning, Lib. I.

Philosophy had found the Learned so full of Prejudices against it, in favour of some Systems lately invented and mightily extolled by speculative Men; that while all admired the sublime Geometry which shone throughout his Work, few for some Time appeared to be disposed to hearken to his Philosophy, or in a Condition to judge of it impartially.

However, Lord Bacon's Exhortations and Example had a good Effect; and experimental Philosophy has been much more cultivated since his Time than in any preceding Period.

His Works were of a miscellaneous Nature. Those on philosophical Subjects were chiefly wrote in *Latin*; the Principal of which are as follow:—The *Novum Organum*; — his *Treatise De Augmentis Scientiarum*; or, *The Advancement and Proficiency of Learning*; — his *Natural History of Winds*; — *Of Life and Death*; — *Of Condensation and Rarefaction*; — the Tract *De Sapientiâ Veterum*; or, *The Wisdom of the Antients*; — *The Animated Astronomy*; — *The New Atlantis*; — and *Sylva Sylvarum*; with many other particular Tracts, which are not at this Time of much Importance to mention.

The LIFE of Sir HENRY SAVILE.

HENRY SAVILE, was born at *Bradley*, near *Hali-fax*, in *Yorkshire*, *November 30, 1549*, and was second Son of *Henry Savile, Esq.* He was first entered into the University of *Oxford*, in the Beginning of the Year *1561*, and on *January the Fourteenth, 1565*, took the Degree of Bachelor of Arts, and afterwards, was elected Fellow of *Merton College*, *April 30, 1570*. He took the Degree of Master of Arts; and growing famous for his Skill in the *Greek Language*, and *Mathematics*, (in which Science he voluntarily read a Lecture for some Time) he was elected Proctor of the University, for the Years *1575* and *1576*, with *John Underhill*, of *New College*, afterward Rector of *Lincoln College*, and Bishop of *Oxford*, in *1578*. He travelled into *France*, and other Countries, and improving himself in learning Languages and the Knowledge of Men, returned a most accomplished Person; and about that

Time became Tutor to Queen *Elizabeth*, in the *Greek Tongue*, who had a great Esteem for him. In 1585, he was made Warden of *Merton College*, and in 1596, Provost of *Eaton College*, in which Character he made it his great Care to promote Persons distinguished for Learning. When King *James* the Ist. came to the Crown, he would have advanced him to greater Dignity in the Church or State, but our Author accepted only the Honour of Knighthood from his Majesty at *Windsor*, Sept. 21, 1604; about which Time, his Son and Heir, *Henry*, dying, he bestowed great Part of his Estate in the Publication of Books, which obtained him the highest Character among all Persons of distinguished Learning in that Age. Dr. *William Bishop* styles him a Man of admirable Skill in the *Greek* and *Latin* Languages, and a laborious Searcher, and generous Publisher of the Remains of venerable Antiquity. This Character was confirmed by *Isaac Casaubon*, *John Boyle*, *Joseph Scaliger*, Dr. *Richard Montague*, and Others, who were Contemporaries with him, and well acquainted with his Writings. — But that which still more enhances his Character is, that in the Year 1619, he founded both an Astronomical and Geometrical Lecture in *Oxford*, and gave the Former to Dr. *Bambridge*, and the Latter to Mr. *Briggs*, and liberally endowed the Professorships. — Sir *Henry* had himself for some Time discharged that Province, and read thirteen Lectures upon the first eight Propositions of *Euclid's Elements*, (which were afterwards printed) and then he surrendered the Chair to Mr. *Briggs*, after taking Leave of his Audience, in his last Lecture, with these Words, *Trada lampadem successori meo, doctissimo viro, qui vos ad intima Geometriæ mysteria perducet*. He died at *Eaton College*, Feb. 19, 1621, and was interred in the Chapel there, near the Body of his Son *Henry*, who died in 1604, leaving behind him an only Daughter, named *Elizabeth*, who afterwards married Sir *John Sedley*, of *Kent*, Bart. Upon the News of Sir *Henry's* Death, the Vice-Chancellor of *Oxford* and the Doctors ordered a Speech to be publicly made in Honour of him; which was done by Mr. *Thomas Goffe*, of *Christ Church*, and shortly after published; with several Copies of Verses added to it; and an honorary Monument was erected to him in the South Wall, at the upper End of the Choir of *Merton College*. His

His Works were as follow :

I. He translated into *English*, *The End of Nero*, and the Beginning of Galba, *Four Books of the Histories of Cornelius Tacitus*, and *The Life of Agricola* ; with Notes. Printed in London, 1581.

II. *A View of certain military Matters*, 1598.

III. *Fasti regum & episcoporum Angliæ usque ad Willielmum Seniores*, Fol. 1596.

IV. A noble Edition of St. Chrysostom's Works in Greek, printed at Eaton, 1613.

V. *Thomæ Bradwardini archiepiscopi, olim Cantuariensis, de causâ Dei contra Pelagium, & de virtute causarum ad suos Mertonenses, libri tres*, Lon. 1618.

VI. *Prælectiones XIII in principium Elementorum Euclidis*, Oxoniæ, habitæ, ann. 1620.

VII. *Oratio coram reginâ Elizabethâ*. Oxoniæ, habita, ann. 1592.

VIII. He translated into *Latin*, King James's *Apology for the Oath of Allegiance*.

He likewise published *A Treatise on the Original of Monasteries*, —and *An Oration on the Union of England and Scotland* ; — with Notes on many of his Books ; — as also *Letters to Mr. Camden*, &c. &c.

The LIFE of JOHN NEPER, BARON of MARCHISTON.

JOHN NEPER, or Napier, commonly called Lord Neper, and Baron of Marchiston, descended from a very antient and honourable Family, near *Edinburgh*. His Father, Sir Archibald, was knighted by King James VI. and was made Master of the Mint, which Office he sustained with Dignity. His Son and Heir, whose high Attainments in many Branches of useful Literature, render his Memory valuable to Posterity, was born in the Year 1550. His Father, discovering a very early Propensity in his Son to Reading and Study, made it his Care to give him every proper Assistance for his Improvement, which

which joined with an uncommon Affiduity, produced many new, curious, and useful Inventions, such as do Honour to his Abilities in the mathematical Science, amongst which is his Invention of what is commonly called *Lord Neper's Bones*, or *Rods*.

His Invention of the *Five circular Parts*, is no small Improvement in Trigonometry; but above all, his Invention of LOGARITHMS, discover his deep Penetration and amazing Genius.

Mr. *John Wood* tells us, -“ That one Dr. *Craig*, a Scotchman, coming out of *Denmark* into his own Country, called upon *John Neper*, Baron of *Marchiston*, near *Edinburgh*, and told him (among other Discourses) of a new Invention in *Denmark*, by *Longomontanus*, as 'tis said to save the tedious Multiplication and Division in astronomical Calculations. *Neper* being solicitous to know farther of him concerning this Matter, he could give no other Account of it, than that it was by proportional Numbers, which Hint *Neper* taking, he desired him at his Return to call upon him again.” *Craig*, after some Weeks had passed, did so, and *Neper* then shewed him a rude Draught, of what he called *Canon mirabilis Logarithmorum*. As the Story is told, one may think it strange, that *Longomontanus* should no where lay claim to the Honour of this admirable Invention, but leave the Glory of its first Discovery to be solely ascribed to the Baron of *Marchiston*. This Invention was no sooner known, than it gained the general Applause of the eminent Mathematicians of that Age, who found it to answer what the noble Author had said of it, in his Dedication to Prince *Charles*. But no one more extolled it than Mr. *Briggs*, who speaks thus of it. “ *Neper*, Lord of *Marchiston*, has set my Head and Hands at Work with his new and admirable Logarithms.” In 1616, the Baron published his *Rabdologia*, in the Dedication of which to the Lord Chancellor *Seton*, he mentions another Species of Logarithms, different from what he had published in 1614, and which he had invented since that Time; and it seems plain, that the Baron, being sensible of his declining Health, when he had the Opportunity of seeing Mr. *Briggs*, was more desirous of communicating to him his new invented Method, to engage him more firmly in the Prosecution of that useful, but laborious Work; and as Mr. *Briggs* stayed

Stayed with him a Month, in their Conversation upon that Head, the Baron told him, he was sensible the Logarithms might be altered for the better before he published his Canon; but chose to have them printed in the Manner he had proposed them, till he had Leisure and Health to make others more commodious, which he thought would be best, if a Cypher was made the Logarithm of (1) or Unity, and 10000000000, that of the whole Sine, or Radius. Mr. Briggs, upon his Return to London, threw by those calculated upon the former Scheme, and made others suggested by the Baron; and having made these Calculations with much Difficulty and Labour, the Summer following he made a second Journey to *Edinburgh*, and communicated them to the Baron, who highly approved of them, and earnestly pressed him to proceed; and it is plain from Mr. Briggs's Account, that they both saw an Alteration from the first Plan in the Canon would be very convenient, and had formed a different Scheme before they knew each other's Sentiments; but when they came afterwards to converse together, Mr. Briggs came into that proposed by the Baron, as the more commodious. Upon this Plan Mr. Briggs's *Arithmetica Logarithmica* was formed and published in the Year 1624; so that, from the Concession of Mr. Briggs and others, we may conclude, that Lord Neper has a just Claim to the first Invention of Logarithms, tho' others have since made great Improvements therein.— Besides the excellent Inventions above-mentioned, he has published two others very considerable; one is entitled, *A Promptuary of Multiplication*, by which the long Operations of that Rule are very easily and expeditiously wrought by Means of *Lamellæ*, or thin Plates, with the Figures properly disposed upon them, and contained in a small Box. The other he calls *Local Arithmetic*, performed by Figures and Letters jointly, on each of which he has wrote a considerable Treatise, which was published with his *Rabdologia* at *Leyden*, in the Year 1626. We have no farther Memoirs of this singular Genius for Invention. He died in the Year 1622, and in the 72d Year of his Age. To perpetuate his Memory for his four Inventions, the following Lines were inscribed to him in the last mentioned Edition of his *Rabdologia*.

JOHANNI NEPERO.

*Ergo in tam faciles numerorum tædia lusus**Versa, mathematicos qui latuere prius !**Dum Logarithmus erit, dum Virgula, Scacchia, Lamnæ,**Magnum erit & nomen, magne NEPERE, tuum.**The LIFE of HENRY BRIGGS.*

HENRY BRIGGS, an eminent Mathematician of the 16th Century, descended from the antient Family of that Name at *Salle* in *Norfolk*, was born at *Warleywood*, near *Halifax*, in *Yorkshire*, about the Year 1556. After his Education at a Grammar-school in that Country, he was sent to *St. John's College, Cambridge*, and admitted a Scholar of the House, November 5, 1579, took the Degree of Bachelor of Arts, 1581; that of Master in 1585; and was chosen Fellow of his College, March 29, 1588. He applied himself chiefly to the Study of the Mathematics, in which he greatly excelled, and in 1592, was made Examiner and Lecturer in that Faculty; and soon after, Reader of the Physic Lecture, founded by Dr. *Linacer*. Upon the Settlement of *Gresham College*, in *London*, he was chosen the first Professor of Geometry there. About the Beginning of *March*, 1596, and some Time after, he constructed a *Table*, by the Help of which the magnetical Declination being given, the Height of the Pole may easily be found. This *Table* was suited to an Instrument described by Dr. *Gilbert*, and published by Mr. *Blondivelle*. In 1609, Mr. *Briggs* contracted an Intimacy with the learned Mr. *James Usher*, afterwards Archbishop of *Armagh*, which was kept up many Years by Letters; two of which, written by our Author, are yet extant in Archbishop *Usher's* Letters; in the Former of them, dated in *August*, 1610, he tells his Friend, he was engaged in the Subject of *Ellipses*, and in the Latter, dated *March* 10, 1615, he acquaints him with his being wholly employed about the noble Invention of *Logarithms* then lately discovered.

The Life of HENRY BRIGGS. 235

In the Year 1616, Mr. Briggs made this Invention his principal Study, and took a Journey into *Scotland*, in order to converse with, and receive Improvement therein from *John Neper*, Baron of *Marchiston*, mentioned in the preceding Life; and he made him a second Visit in 1617, with the same Intent; and for the Sake of his Friends and Hearers in *Gresham College*, he printed in 8vo. his *Logarithmorum Chilias prima*. These Logarithms, he tells us, in the Preface, are of a different Kind from those published by the illustrious Inventor of the Art, in his *Canon Mirificus*. He was made *Savillian* Professor of Geometry at *Oxford*, January 8, 1620, (tho' he continued to hold his Professorship of *Gresham College*, till the 26th of January) which he opened with an eloquent Oration: And as Sir *Henry Savile*, the Founder of that Lecture, had previously read 13 Lectures upon the first eight Propositions of *Euclid's Elements*, he began his Lectures with the Ninth.

Upon his going to *Oxford*, he settled himself at *Merton College*, and soon after was incorporated Master of Arts in that University, where he continued till his Death. In 1622, he published a small Tract in 4to. concerning the North-west Passage to the *South-Sea*, through the Continent of *Virginia* and *Hudson's Bay*, the Reason of which was, probably, his being then a Member of the Company trading to *Virginia*. His next Performance was his great and elaborate Work, intitled, *Arithmetica Logarithmica*, in Folio, printed at *London* in 1624, of which there was a second Edition, with Improvements, by Mr. *Adrian Vlacq*, published in *Holland*. This Edition, with the Improvements, was translated into *English* in 1631, with the following Title, *Logarithmical Arithmetic; or Tables of Logarithms* for absolute Numbers, from an Unite to 100000; as also for Sines, Tangents, and Secants, for every Minute of a Quadrant, with a plain Description of their Use in Arithmetic, Geometry, Astronomy, Navigation, &c. which we have already said, were first invented by the most excellent *John Neper*, Baron of *Marchiston*; but were transformed, and the Foundation and Use of them illustrated by *Henry Briggs*.—Soon after, our Author engaged in another grand Work, intitled *Trigonometria Britannica*; he proposed to compleat it in two Books; but lived to write the First only, leaving the Second

cond to the Care of his old Friend Mr. *Henry Gellibrand*, who finished the Work and published it.

This great Mathematician died the 26th of *January*, in *Merton College*, where some Account of him and his Works are registered, to perpetuate the Honours of his Memory. We learn from this Account, that the Principals of the University attended his Funeral; that a Sermon was preached by Mr. *Sellar*, and a funeral Oration was spoken by Mr. *Cressley*, Fellows of *Merton College*, on that Occasion. He lies buried in the Choir of the Chapel there, under the honorary Monument of Sir *Henry Savile*, a plain Stone being laid over him, with his Name only inscribed on it. Besides the Pieces already mentioned, Mr. *Briggs* wrote many others; some of which have never been published, and others since published by other Persons; as, *Tables* for the Improvement of Navigation;—a *Table* of the Sun's Declination to every Minute of the *Ecliptic*, in Degrees, Minutes, and Seconds;—a *Table* of the Sun's *Prosthaphæreses*;—a *Table* of Equations for the Sun.—*Tables* to find the Height of the Pole in any Latitude, from the Height of the Pole-star.—These *Tables* are printed in the 2d Edition of Mr. *Edward Wright's* Works, intituled, *Certain Errors in Navigation detected and corrected*.—Likewise his first six Books of *Euclid's Elements*, printed without his Name, &c. With Respect to his Character, and the Opinion of Writers concerning him, Dr. *Smith* gives him the Character of a Man of great Probity, easy of Access to all; free from Arrogance, Moroseness, Envy, Ambition and Avarice. A Contemner of Riches, and contented with his own Station; preferring a studious Retirement to all the splendid Circumstances of Life. The learned Mr. *Thomas Gataker*, who attended his Lectures, when he was Reader of Mathematics at *St. John's College*, in *Cambridge*, represents him as highly esteemed by all Persons skilled in Mathematics, both at Home and Abroad; and says, that desiring him once to give his Judgment concerning *Judicial Astrology*, his Answer was, “That he conceived it to be a mere System of groundless Conceits.”

Mr. *Oughtred* calls him the Mirror of the Age, for his excellent Skill in Geometry; but his Successor at *Gresham College*, the famous Dr. *Isaac Barrow*, in his Oration there upon his Admission, has given his Character more fully; wherein he celebrates his great Abilities, Skill, and Industry, in perfecting *Neper's* admirable Invention of *Logarithms*, which, without his Care and Pains, might have continued an imperfect and useless Design.

The LIFE of GALILEO.

GALILEI, or *Galileo*, an eminent Mathematician and Astronomer in *Italy*, was born at *Pisa*, on the 19th of *Feb.* 1564. His Father's Name was *Vincenzo Galilei*. According to the Inclination of his own Genius, he gave himself wholly to the Study of *Euclid*, and afterwards of other Mathematicians of the best Esteem; and in this, he made a vast Progress, almost entirely by the Efforts of his natural Abilities. In 1592, he was made Professor of Mathematics in the University of *Padua*, where he made his inaugural Oration *Dec. 7, 1592*, and continued in this Post to the Year 1611, when *Cosmo II*, Grand Duke of *Tuscany*, sent for him to be Professor at *Pisa*, and settled upon him a very considerable Stipend. That Prince afterwards sent for him to *Florence*, and gave him the Title of principal Philosopher, and Mathematician to his Highness. His Assertion of the Earth's Motion exposed him to the severest Censures of the Inquisitors, who obliged him to retract that Opinion. In the Year 1615, he was cited to *Rome*, to appear before the Holy Office, and charged with Heresy, for maintaining these two Propositions; the First of which was, That the Sun is the Center of the World, and immoveable; which Proposition they censured as absurd, and false in Philosophy, and formally heretical, as being expressly contrary to the Sacred Scriptures. II. That the Earth is not the Center of the World, but moves with a diurnal Motion. This likewise they condemned as a Proposition absurd, and false in Philosophy, and theologically considered, erroneous with regard to Faith.

He was detained in the Inquisition till *February* 1616, on the 25th of which Month, he had Sentence pronounced against him, and he was commanded, by a Decree of the Inquisitors, to renounce his heretical Opinions, and not to defend them either by Word, or Writing, or insinuate them into the Minds of any Persons: Nor was he discharged, till he had promised to conform himself to this Order; but upon his publishing at *Florence*, in 1632, his *Dialogues* concerning the two great Systems of the World, the *Ptolomaic* and *Copernican*, he was again cited before the Holy Office; by whose Order, he was committed to the Prison of that Office at *Rome*; and upon the 22d of *June*, N. S. that Year, the Congregation convened, and in his Presence pronounced Sentence against him and his Book, and obliged him to abjure his Errors in the most solemn Manner; committing him to the Prison of the Holy Office during Pleasure, and commanding him, as a saving Penance, for three Years to come, to repeat, once a Week, the seven penitential *Psalms*; but reserving to themselves the Power of moderating, changing, and taking away, altogether, or in Part, the above-mentioned Punishment and Penance. He was discharged from his Confinement in 1634; but the Impression of his *Dialogues* concerning the System of the World was burnt at *Rome*: Soon after he went to *Venice*, where he was informed, that a Glass was found out in *Holland*, by Means of which, Objects at a great Distance were rendered as visible as if they were near at Hand. Without ever seeing this Instrument, he began to consider what the Manner of its Form might be, and how it might be made; and at last, invented the *Telescope*, by the Application of which to the Heavens, he made many important Discoveries.

He discovered the Surface of the Moon not to be smooth, but rough, and full of Prominencies and Cavities.——He observed a new Motion of Trepidation; the Moon appearing to him sometimes to shew more of one Side, and sometimes more of the other:——He found that *Venus* imitated the Aspects of the *Moon*, appearing now round, then one Half; afterwards gibbous, &c.—He demonstrated a very sensible Change in Magnitude in the apparent Diameters of *Venus* and *Mars*; a Matter of no small Consequence in the Theories of *Copernicus* and *Tycho*.——He discovered Spots in the Sun, which he

he saw were not fixed and constant, like those of the Moon, but changeable, appearing, as it were, to move about the Sun. He found, that, about *Jupiter*, four other Planets were moving, never before discovered by any Person, which in Honour of the Duke *de Medicis*, the *Mæcenas* of all learned Men, and his great Patron, he called by the Name of *Medicean Stars*. By the frequent Eclipses of these Stars, he had Thoughts of finding out the Longitude, much better than by the Lunar Eclipses; upon which, he composed his *Tables* of their Motions, leaving them with *Vicenzo Renieri*, a Mathematician of *Pisa*, who corrected, perfected, and intended to commit them to the Press. He imagined, that the Planet *Saturn* was tricorperate, or composed of three Bodies; one spherical, especially that in the Midst, and two other lesser ones on the Sides, which afterwards appeared to be only the *Ansxæ*, or extreme Parts of *Saturn's* Ring, seen obliquely on each Side the Planet. He demonstrated, that the *Via Lactea*, or *Milky-Way*, and the nebilous Stars, are no other than a Multitude of little Stars, so near each other, and so small, that the naked Eye cannot distinguish them separately;——all which Observations were made by *Galileo*, in the Compass of a few Years.

During the last eight Years of his Life, he lived out of *Florence*, partly in some Towns near that City, and partly at *Sienna*. By his continual Observation of the Heavens, and many Injuries which he received by the nocturnal Air, his Sight was much weakened, and three Years before his Death, he became entirely blind. He bore this Misfortune with a true philosophical Resignation, diverting himself with constant Meditation and Enquiry, and had prepared a great Heap of Materials, and begun to dictate his Conceptions, when by a Distemper, of three Months Continuance, insensibly decaying, he expired at *Arce-tri*, near *Florence*, *January* 8, 1642, N. S. in the 78th Year of his Age. He was little of Stature, but of a venerable Aspect, and vigorous Constitution. His Conversation was affable and free, and full of Pleasantry. He took great Delight in Architecture and Painting, and designed extremely well. He likewise played admirably well on the Lute. He took great Pleasure in Husbandry, when he spent any Part of his Time in the Country. His Learning was very extensive. Two Qualifications

tions (amongst others) were observed to be wonderfully united in him, *viz.* Cleanness, and Acuteness of Wit. Monsieur *Libnitz* tells us, “ that from the Time of *Archimedes*, there was Nothing done in mechanical Geometry till *Galileo*, who being a Man of excellent Judgment and great Skill in the most abstruse Points of Geometry, first extended the Boundaries of that Science, and began to reduce the Resistance of solid Bodies to the Laws of it.” Sir *John Finch*, in a Letter to *Thomas Salisbury*, Esq; dated at *Leghorn*, April 17, 1664, observes, “ that many of his Books were unfortunately lost, thro’ his Wife’s Devotion, who, solicited by her Confessor, gave him Leave to peruse her Husband’s Manuscripts, of which he tore, and took away, as many as he said were not fit to be allowed.” Dr. *Stokelham*, in a Letter to Mr. *Salisbury*, dated at *Padua*, Aug. 2, 1663, observes, “ that the Instrument, or Machine, with which the *Venetians* render their *Laguna* fluid and navigable, was *Galileo’s* Invention.—And a *Florentine* Academic, in a little Tractate of his, asserts the Problem of the *Cycloid* to have been *Galileo’s*, though the Solution thereof was afterwards made by *Torricelli*.

The principal Treatises which he published are as follow :

I. The Operations of the Compass, Geometrical and Military.

II. A Discourse, addressed to the most Serene *Cosmo*, Grand Duke of *Tuscany*, concerning the swimming of Bodies upon, and their Submersion in Water.

III. *Mechanics* ; or the Benefits derived from that Science, and its Instruments.

IV. *Galileo’s* Balance, for finding the Proportion of Alloy, or mixt Metals.

V. His *Nuncius Sidereus*.

VI. A Continuation of the *Nuncius Sidereus* ; or an Essay on the History of his last Observations on *Saturn*, *Mars*, *Venus*, and the *Sun*.

VII. A Letter, concerning the Trepidation of the *Moon*, lately discovered by him, inscribed to *Alphonso Antonini* ; with *Antonini’s* Answer.

VIII. A Discourse of the Solar Spots, with the Predictions and *Ephemerides* of the Positions and Periods of the *Medicean* Planets.

IX. Problems in *Mathematics*.

X. His Mathematical Discourses and Demonstrations about two New Sciences, relating to *Mechanics*, and *Local Motions*; with an Appendix concerning the Center of Gravity of some *Solids*.

XI. A Treatise of the *Mundane System*. With several others of a Philosophical, Mathematical, and Scientifical Kind.

The Preceding is the general Account we meet with, of the Discoveries and Writings of *Galileo*: To which we think proper to add some further ingenious Observations and Reflections on this Author, by the judicious Mr. *Maclaurin*. He says,

“ Geometry and Philosophy advanced in this Time at a great Pace, and gave mutual Aid to each other. The Evidence of Geometry began to take Place and Philosophy, while all Things were examined by Number, Weight, and Measure; and the Principles of the Theory of Motion, being now clearly understood, furnished excellent Illustrations of the abstruse Parts of Geometry. *Galileo* had Scholars worthy of so great a Master, by whom the Gravitation of the Atmosphere was established fully, and its varying Pressure accurately and conveniently measured, by the Column of Quick-silver of equal Weight sustained by it in the barometrical Tube. The Elasticity of the Air, by which it perpetually endeavours to expand itself, and, while it admits of Condensation, resists in Proportion to its Density, was a Phænomenon of a new Kind (the common Fluids having no such Property) and of the utmost Importance to Philosophy. These Principles opened a vast Field of new and useful Knowledge, and explained a great Variety of Phænomena, which had been accounted for in an absurd Manner before that Time. It seem'd as if the Air, the Fluid in which Men lived from the Beginning, had been then first discovered. Philosophers were every where busy enquiring into its various Properties and their Effects; and valuable Discoveries rewarded their Industry. Of the great Number who distinguished themselves on this Occasion, we cannot but mention *Torricelli* in *Italy*, *Pascal* in *France*, *Otto Guerick* in *Germany*, and *Boyle* in *England*.

“ *Galileo* made surprizing Discoveries in the Heavens by the Telescope, an Instrument invented in that Time; and, by applying Geometry to the Doctrine of Motion, began to establish natural Philosophy on a sure Foundation. He made the Evidence of the *Copernican* System more sensible, when he shewed from the Phases of *Venus*, like to the monthly Phases of the Moon, that *Venus* actually revolves about the Sun. He proved the Revolution of the Sun on his Axis, from his Spots; and thence the diurnal Rotation of the Earth became more credible. The four Satellites that attend *Jupiter* in his Revolution about the Sun, represented, in *Jupiter's* lesser System, a just Image of the great solar System; and rendered it more easy to conceive how the Moon might attend the Earth, as a Satellite, in her annual Revolution. By discovering Hills and Cavities in the Moon, and Spots in the Sun constantly varying, he shewed that there was not so great a Difference between the celestial and sublunary Bodies as the Philosophers had vainly imagined.

“ He did no less Service by treating, in a clear and geometrical Manner, the Doctrine of Motion, which has been justly called the Key of Nature. The rational Part of Mechanics had been so much neglected, that there was hardly any Improvement made in it, from the Time of the incomparable *Archimedes* to that of *Galileo*; but this last named Author has given us fully the Theory of equable Motions, and of such as are uniformly accelerated or retarded, and of these two compounded together. He, first, demonstrated, that the Spaces described by heavy Bodies from the Beginning of their Descent are as the Squares of the Times, and that a Body, projected in any Direction that is not perpendicular to the Horizon, describes a Parabola. These were the Beginnings of the Doctrine of the Motion of heavy Bodies, which has been since carried to so great a Height by Sir *Isaac Newton*.

He also discovered the Gravity of the Air, and endeavoured to compare it with that of Water; and opened up several other Enquiries in Natural Philosophy. He was not esteem'd and followed by Philosophers only, but was honoured by Persons of the greatest Distinction of all Nations. *Des Cartes*, indeed, after commending him for applying Geometry to Physics, complains that he had not examined Things in order, but had

enquired into the Reasons of particular Effects only ; adding that, by his passing over the primary Causes of Nature, he had built without a Foundation. He did not, 'tis true, take so high a Flight as *Des Cartes*, or attempt so universal a System ; but this Complaint, I doubt, must turn out to *Galileo's* Praise ; while the Censure of *Des Cartes* shews that he had the Weakness to be vain of the worst Part of his Writings.

The LIFE of THOMAS HOBBS.

THOMAS HOBBS, one of the greatest Geniuses of the Seventeenth Century, was born at *Malmesbury*, April 15, 1588. He had made a great Proficiency in the Languages, when he was sent, at fourteen Years of Age to *Oxford*, where he studied, for five Years, *Aristotle's Philosophy*. He afterwards went into the Family of *William Cavendish*, who, soon after, had the Title of Earl of *Devonshire* conferred upon him ; and he was Governor to his eldest Son. He travelled into *France* and *Italy* with his Pupil ; and perceiving that he remembered but little either of his *Greek* or *Latin*, and that the Philosophy of *Aristotle*, in which he had made a considerable Progress, was despised by Persons of the best Sense, he applied himself intirely to polite Literature, upon his Return to his own Country. *Thucydides* appearing to him preferable to all the *Greek* Historians, he translated him into *English*, and published that Translation in 1618, in order to shew the *English*, from the *Athenian* History, the Disorders and Confusions of a democratical Government. In 1629 he travelled into *France*, as Governor to a young *English* Gentleman, and applied himself, to the Study of the Mathematics. He began then to apply himself, with great Pleasure, to the Study of *Euclid*, being not so much induced to it by the Subjects of the Demonstrations, as delighted with the Perspicuity, Certainty, and uninterrupted Series of his Reasoning : For this most sagacious Man did not admire the Science of Mathematics on Account of the subtle Demonstrations of the Properties, and mutual Relation of Sides and Angles, or Numbers, Lines, Surfaces, or Bodies, since he readily saw that all these Things were remote from the Uses of common Life,

Life, tho', when reduced to Practice, of no small Advantage; but because, by the Method peculiar to it, the Understanding is best led to the Knowledge of Things, and supplied with the most certain Means of discovering difficult Truths, proving what is true, and refuting what is false. During that Journey, in 1631, he was employed by the Countess of *Devonshire* to be Tutor to her Son, about thirteen Years old, and travelled with him three Years after into *France* and *Italy*. During his Stay at *Paris*, he applied himself to the Study of Natural Philosophy, and especially to the Enquiry into the Causes of the sensitive Operation of Animals. He discoursed with Father *Marsenneus* deeply upon this Point. He was recalled to *England* in 1637, but, foreseeing the Civil War, upon reflecting on what passed during the first Session of the Parliament of 1640, he went to *Paris* to seek an agreeable Retreat there, in order to philosophize quietly with Father *Marsenneus*, *Gassendi*, and some other Great Men. He wrote there his Book *de Cive*, of which he published but a few Copies in 1642. He taught Mathematics to the Prince of *Wales*, who had been obliged to retire to *France*, and spent all his leisure Time in composing his *Leviathan*, which he caused to be published in *England* in 1651. He still resided at *Paris*. Tho' he had given Proof of his Faith according to the Rites of the Church of *England*, yet he was rendered obnoxious to the Episcopal Party; and this was carried so far, that he was ordered not to come near the King any more. This was the Reason of his returning to *England*, where he lived but in an obscure Manner, considering his great Merit, in the Earl of *Devonshire's* House. However, he gained this Advantage by his obscure Condition, that he had more Leisure to compose his Book *de Corpore*, and some others. He received great Marks of Respect from K. *Charles II.* at the Restoration in 1660: From that Time, till his Death, he applied himself to his Studies, and to oppose the Attacks of his Adversaries, who were very numerous. He retained the Use of his Senses till he was above 91 Years old. His long Life was that of a perfect honest Man. He was a Lover of his Country, he was faithful to his King, a good Friend, charitable and obliging. However he was censured as an Atheist; but the Writers of his Life maintain, that he had very orthodox Notions concerning the

the Nature of God. They own, that in his Youth he was addicted to Wine and Women; but that, however, he chose to live a Bachelor, that he might not be diverted from the Study of Philosophy. He addicted himself much more to Thinking, than Reading; and was never fond of a great, but well-selected Library. Towards the End of his Life he had very few Books, and those he read very little, thinking his chief Business was to digest what he had read. If Company came to visit him, he would be free in his Discourse; but if much pressed, or contradicted, he had the Infirmary of being short and peevish, and referred to his Writings for their better Satisfaction, of which his Friends cautioned those who came to converse with him. In *October* 1666, when Complaint was made to Parliament against his Books, and some Proceedings against him were depending, with a Bill against Atheism and Profaneness, he was at *Chatsworth*, and appeared extremely disturbed at the News of it, fearing that Messengers would come for him, that the Earl of *Devonshire* would deliver him up, that the two Houses of Parliament would commit him to the Bishops, and that they would decree him an Heretic and return him to the Civil Magistrates by a Writ *de Heretico Comburendo*. This Terror upon his Spirits made him sink very much: He would be often confessing to those about him, that he meant no Harm; but persisting in this, that there was no Authority to determine what was Heresy. He also framed an Apology for his *Leviathan*, setting forth, that the exceptionable Things therein were not so much his Opinion, as Suppositions, humbly submitted to those who had the Ecclesiastic Power, and never dogmatically maintained by him in Writing, or Discourse: And it is likewise asserted, that he preserved a constant Attention to the Communion of the Church of *England*. Nevertheless, he did not conceal his Hatred to the Clergy, asserting, when called in question, they could not teach him what he did not know. At the Close of his Life, he expressed great Anxiety about Death, and spake of it as an unknown, uncertain State. He died, *December* 4, 1679, at the Earl of *Devonshire's* House, after a Sickness of six Weeks. The principal Treatises which he wrote were,

I. He translated into *English*, the *History of the Grecian War*, by *Thucydides*, 1628.

II. *De Mirabilibus Pecci*.

III. Elements of Philosophy.

IV. An Answer to Sir *William Davenant's* Epistle, or Preface to *Gondibert*.

V. Human Nature, or the fundamental Elements of Policy.

VI. Elements of the Law.

VII. *Leviathan*; or the Matter, Form, and Power of a Commonwealth.

VIII. A Compendium of *Aristotle's* Rhetoric.

IX. A Letter on Liberty and Necessity.

X. The Questions, concerning Necessity and Chance, stated.

XI. Six Lessons to the Professors of Mathematics, of the Institution of Sir *Henry Saville*.

XII. The Marks of absurd Geometry, &c.

XIII. Dialogues of Natural Philosophy.

Besides many other Pieces on Polity, Theology, and other miscellaneous Subjects, to the Number of 41.

The LIFE of MICHAEL MÆSTLINUS.

MICHAEL MÆSTLINUS was born in the Palatinate of the *Rhine*, about the Year 1542. When his Parents had given him a proper Education, he was elected a Parish Priest at *Bachnang*; but the Proofs he gave of his Skill in the Mathematics so far distinguished him, that he was promoted to the Professorship of Mathematics in the Universities of *Heidelberg* and *Tubinge*, Master, or Tutor to *Kepler*, and first Monitor to the famous *Galileo*. He was addicted, before that Time, to the Study of *Aristotle* and *Ptolemy*; but, after more mature Inquiry, he embraced the *Copernican* Hypothesis, to which he was persuaded by the Force of his Arguments, which he made Use of in a public Lecture upon that Subject, about that Time, in *Italy*. The Variety of Subjects which he wrote upon, in the Philosophical and Astronomical Sciences, bespeak his great Improvement and Abilities. He wrote *De Stella Nova Cassiopeiæ*

The Life of FRANCISCUS VETA 247

Cassiopeia, and of the Comet which appeared in 1576: As also, *Ephemerides*, according to the *Prutenic Tables**; and Additions to the first Narration of *Rheticus*; with an Appendix, *de Dimensionibus Orbium Cælestium*, according to the Opinion of *Copernicus*. He published likewise, *Thesis de Eclipsibus*, and an *Epitome of Astronomy*. — He likewise wrote against the *Gregorian Calender*, in which he was opposed by *Clavius*; yet, very happy in this, that he always express his great Satisfaction in having adopted the *Copernican System*, which he thought was supported by incontestible Evidence. History does not inform us of the Time of his Death, or any other Circumstances relating thereto. Pity the Character of so great a Man should not be more minutely transmitted to Posterity.

The LIFE of FRANCISCUS VIETA.

FRANCISCUS VIETA, a Frenchman, Native of Fontenoy, whom *Ricciolus* intitles, *Galicanæ Matheseos insignis decus*. Besides his many other excellent Works in Geometry, and other Parts of the Mathematics, he exhibited to Pope *Clement VIII.* a new Form of the *Gregorian Calender*, to which he added, perpetual Canons, and an Explication thereof, against *Clavius*, whom he accused to have deformed the true *Lilian Reformation*, by not rightly understanding the Reason of it: Touching which Controversy, *Thuanus*, in the 129th Book of his History, writes more particularly. But the Work chiefly esteemed, and whose Loss cannot be sufficiently deplored, was his *Harmonicon Cæleste*, which, being communicated to *Marsennus*, was, by some perfidious Acquaintance of that honest-minded Person, surreptitiously taken from him, and irrecoverably lost, or suppressed, to the unspeakable Detriment of the lettered World. His Works, which are at present extant, are all collected into one Volume, by *Van Schooten*, a learned Dutch Mathematician, and printed by *Elziver* at *Leyden*,

* These *Prutenic Tables* were first published by *Erasmus Reinholdus*, in the Year 1551; this was a Work of seven Years Labour, which he spent in correcting the Numbers of *Copernicus*. He was a learned Professor of Mathematics in the Academy of *Vitebergh* in Germany, and died in 1553.

den, in the Year 1646; they consist of Sixteen different Treatises upon Analitical, Geometrical, and Chronological Subjects, many of which contain Problems of a curious Nature, and not to be met with in other Authors. There were other Works of an astronomical Kind, which have been buried in the Ruins of Time. Our Author flourished about the Year 1590; but of the Time of his Death we have no certain Account.

The LIFE of WILLIAM, PRINCE of HESSE.

WILLIAM, Landgrave of *Hesse*, merits an Elogium beyond what can be here given, for his assiduous Observations, for many Years, of the celestial Bodies; to which End, at *Cassells*, he erected an Observatory, with excellent Instruments, well adapted to such a Design, and called to his Assistance two eminent Artists, *viz. Christophorus Rothmannus* and *Iustus Byrgius*. He made many Observations of a very curious Nature, which were published at *Leyden* in the Year 1618, by *Willebrodus Snellius*, and are in Part mentioned by *Tycho Brahe*, as well in his Epistles as in the second Tome of his *Progymnasmata*, a signal Example to all princely and heroic Minds, to undertake the promoting and advancing this truly noble and celestial Science. He died in the Year 1597.

The LIFE of HUGO GROTIUS.

HUGO GROTIUS, one of the greatest Men in *Europe*, considering his Abilities every Way, was born at *Delft*, 1583. His Father was named *Hugo de Groot*, that is, *Hugo the Great*, a Burgo-Master at *Delft*, who took great Care to give his Son an Education suitable to his promising Genius; and he made so rapid a Progress in his Studies, that he composed Verses, on several Subjects, when he was not more than nine Years old; and, at fifteen, had attained a considerable Skill in Philosophy, Divinity, and the Civil Law. He had made still
great

greater Proficiency in polite Literature, as appears from the Commentary he made, at that Age, on *Martianus Capella*, in 1598. He accompanied the *Dutch* Embassador into *France*, and was honoured with several Marks of the Esteem of *Henry IV.* He also took his Degree of Dr. of Laws, in that Kingdom; and, at his Return to his native Country, he devoted himself to the Bar, and pleaded before he was seventeen Years of Age, when he was appointed Attorney General. He settled in *Rotterdam*, in 1613, and was nominated *Syndic* of that City; but did not accept of the Employment till he had a Promise that he should not be removed from it. He acted thus prudently, because he foresaw that the Quarrels of the Divines, on the Doctrine of Grace, might probably occasion many Revolutions in the chief Cities: But however prudent in some Cases, he so far embarked in the Affair that proved the Ruin of *Barneveldt*, that he was seized in *August* 1618, and sentenced to perpetual Imprisonment. The Manner in which his Wife effected his Escape is so remarkable, that a brief Account of it may be agreeable. *Mary de Regelsberg*, his Wife, observing that his Keepers had often fatigued themselves with searching a great Trunk of Books and Papers of his, she desired she might remove it to a Friend's House; and she advised her Husband to get into this Trunk, after boring some Air-holes in it: He complied with her Advice, and, getting into this Chest, was carried in this Manner to a Friend's House, at *Gircum*, unsuspected, from whence he went to *Antwerp*; the Wife, in the mean Time, feigning that he was extremely ill, till he was got into a Place of Safety, and then laughed at the Keepers, and said, the Bird was flown. At first, there was some Design formed of prosecuting her; but the Majority over-ruled, and applauded her Artifice and Affection, and gave her immediate Liberty. He and his Wife then returned to *France*, where he was graciously received. *Lewis XIII.* gave a glorious Testimony to the Virtue of this illustrious Refugee. *Grotius*, notwithstanding the severe Treatment he had met with, still preserved an Affection for his Country, and was ready to apologize for them to the *French* King, whilst they ungratefully endeavoured to prejudice the King against him. *Grotius* now applies himself to his Studies, and committing his Improvements to Writing, during

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his Residence there for eleven Years. He once more returned to *Holland*, where his Stay was but short. He then resolved to go to *Hamburgh*, where he staid some Time, and received very advantageous Offers by the Crown of *Sweden*. *Queen Christiana* appointed him one of her Councillors, and sent him in Quality of Embassador of *France* to *Lewis XIII*. After having discharged the Duties of that Employment, about eleven Years, he left *France*, in order to give an Account to the *Queen Christiana* of his Embassy; he took *Holland* in his Way, and then received many Honours at *Amsterdam*; and when introduced to her *Swedish* Majesty at *Stockholm*, he received many Tokens of her Approbation. He then desired his Dismission, which she granted, tho' with some Reluctance. — In his Return home, he was shipwrecked on the Coast of *Pomerania*. *Grotius*, who was now sick, and uneasy in Mind, continued his Journey by Land; but his Indisposition forced him to stop at *Rosstock*, where he died the 28th of *October*, 1645, highly esteemed, as the great Ornament of Learning and of his Country: Who, notwithstanding the public Character in which he acted with general Applause, wrote many valuable Works.

I. He translated into *Latin* Prose, his Work on the Truth of the *Christain Religion*: Which he composed in *Flemish* Verse, for the Use of the Sailors going to *India*; with a further View to their converting the *Indians*.

II. His incomparable Work *De Jure Belli et Pacis*, was published at *Paris* in 1625.

III. A Commentary *de Imperio Summarum Potestatum Circa Sacra*.

IV. His Notes on the four Gospels, and a Treatise of the Satisfaction of Christ.

V. His *Bibliotheque Universelle*.

VI. His *Aratus* in *Greek*, with Cuts of the several Constellations: To which he added, his own learned Notes, and the Names of the Stars in *Hebrew*, *Arabic*, *Greek* and *Latin*. 'Tis principally on Account of this last learned Work he is entitled to a Place in our *Philosophia Biographia*.

The LIFE of EDWARD BREREWOOD.

EDWARD BREREWOOD was born at *Chester* in 1565, his Father *Robert Brerewood*, thrice Mayor of that City, who, from the promising Genius of his Son, took Care to improve it, by a suitable Education at *Chester*; and, at the Age of sixteen sent him to *Brazen-Nose College* in *Oxford*, where he soon acquired the Character of a hard Student, and has shewn it by the Commentaries which he wrote upon *Aristotle's Ethics*, which were written by him about the Age of twenty-one. In the Year 1590, he took his Degree of Master of Arts.

About the Beginning of *March* 1596, he was chosen the *First Professor of Astronomy* in *Gresham College*, being one of the two, who, at the Desire of the Electors, were recommended to them by the University of *Oxford*. He loved Retirement, and wholly devoted himself to the Pursuit of Knowledge. And tho' he never published any Thing himself, yet he was very communicative, and ready to impart what he knew, to others, either in Conversation or Writing. His Situation at *Gresham College* being agreeable, he did not appear to have had any other Views, but continued there the Remainder of his Life. He died of a Fever, *November* 4, 1613, in the Midst of his Pursuits, and before he had taken proper Methods for collecting and digesting his learned Labours; tho' they were not lost, but, with some Trouble, reduced to proper Order. These were many of them of a miscellaneous Nature, as may be seen in the Catalogue of them in Mr. *Ward's* Lives of the Professors of *Gresham College*, Page 75. He was buried in the Chancel of *St. Helen's Church*, near the Reader's Pew, without any monumental Inscription to perpetuate his Memory.

The LIFE of EDMUND GUNTER.

EDMUND GUNTER was born in the County of *Hertford*; but descended originally from *Gunter's-town* in *Brecknockshire*. He was educated on the Royal Foundation at *Westminster School*, and elected from thence to *Christ-church College*

College in Oxford, in the Year 1599, being then eighteen Years of Age, where he took the Degrees in Arts. Mathematics were the prevailing Studies of his Youth, and about the Year 1606 he invented the *Sector*, and wrote the Description and Use of it in *Latin*, many Copies of which were taken in Writing, but none of them printed. After this, in 1614, he took Orders, became a Preacher, and proceeded to qualify himself for the Degree of Batchelor in Divinity.

But his Genuis still leading him chiefly to Mathematical Pursuits, when Mr. *Williams* resigned the Professorship of Astronomy in *Gresham College*, he was chosen to succeed him, March 6, 1619, two Days after his Surrender. When he was settled at *Gresham College*, his Diligence in his Profession, and the great Improvements he made in Mathematical Science, soon discovered the right Judgment of his Electors, and how much they benefited the Public, in the Choice of him; for the Year following, he published his *Canon Triangulorum*. This was the first Book that was printed of this Kind, of the Nature and Use of which, our Author appears to have had no mean Opinion, and expressed himself concerning it with a great deal of Pleasure, yet with equal Modesty. *Edmund Wingate*, Esq; attributes the Improvement of *Logarithms*, in their Application to *Spherical Triangles*, to our Author, in the following Words: “ Mr. *Edmund Gunter*, Professor of Astronomy, in *Gresham College*, London, “ hath taken great Pains in calculating of a Table containing “ the *Logarithms* of the Sines and Tangents of all the Degrees “ and Minutes of the Quadrant.” The like is done by Mr. *Burton*, in the following Passage: “ What so pleasing can there “ be, if a Man be Mathematically given, as to calculate, or “ peruse *Napier’s Logarithms*, or those Tables of Artificial Sines “ and Tangents not long since set out by my old Collegiate, “ good Friend, and fellow Student of *Christ-church* in *Oxford*, “ Mr. *Edmund Gunter*, which will perform that by Addition “ and Subtraction only, which heretofore *Regiomontanus’s* “ Tables did by Multiplication and Division: Or those elaborate “ Conclusions of his Sector, Quadrant, and Cross-Staff.” The same is more fully expressed by Mr. *Henry Bond*, sen. who says, Mr. *Edmund Gunter* first calculated the Tables of *Logarithms*, Sines and Tangents to eight Places, and caused them

to be printed in 1620. He invented also, the Rule of Proportion, as we are told by Mr. *Oughtred*, who, speaking of *his own Circle of Proportion*, says, “ For these, I must freely confess, I have not so good a Claim against all Men, as for my “ horizontal Instrument: The Honour of the Invention of “ Logarithms, next to the *Lord of Marchiston*, and our Mr. “ *Briggs*, belonging to Master *Gunter*, who exposed their Numbers upon a strait Line. And what doth this new Instrument “ (of mine) called the *Circle of Proportion*, but only bow and “ inflect *Master Gunter’s Line*, or Rule.

In the Year 1624, this Invention was carried into *France* by Mr. *Wingate*, who not only communicated it to most of the principal Mathematicians then at *Paris*, but likewise, at their Request, published an Account of its Use, in the *French Language*: Tho’ this had been then lately done more largely, in *English*, by the Author himself in his Treatise of the *Cross-staff*. But several Years after Mr. *Gunter’s* Death, Mr. *Wingate* having translated his *French Tract* into *English*, published it with many Additions and Improvements, which has since been called *Wingate’s Rule of Proportion*, or *Gunter’s Line*.

Mr. *Gunter* likewise drew the Lines on the Dials in *Whitehall Garden*, and wrote the Description and Use of them, by the Direction of *Prince Charles*, in a small Tract; which he afterwards printed, by the Order of his Majesty King *James*, in the Year 1624. The Dials were placed, as he described them, on a Stone. For a more particular Account of this Dial, see our Miscellaneous Correspondence, Page 833, illustrated by a Copper-plate.

Another Discovery of Mr. *Gunter’s*, tho’ some attribute it to Mr. *Gillibrand*, was, “ That the magnetic Needle, in its “ horizontal Position, doth not retain the same Declination, “ or vary from the true North, in the same Place, at all Times; “ but doth successively vary that Declination from Time to “ Time.” Which, tho’ it were at that Time a new Discovery, is now well known.

Besides what has been already described, he was the Author of many other Inventions and Improvements in the Mathematics, most of which were, first, the Subjects of his Lectures at *Gresham-College*, and afterwards disposed into Treatises, and

printed in his Works. Had he lived longer, the World would, doubtless, have reaped more Fruits of his fertile Invention and great Abilities: But he was taken off, the 10th of *December*, 1626, about the 45th Year of his Age, the Prime of Life for such Studies. He died in *Gresham-College*, and was buried in the Church of *St. Peter the Poor* in *Broad-street*, without any Monument or Inscription; but his Memory will always be preserved, with great Esteem, by those who are Judges of his Worth; and his Instruments will transmit his Name to latest Posterity.

The LIFE of JOSEPH SCALIGER.

JOSEPH SCALIGER, otherwise *Justus Josephus Scaliger*, born at *Agen*, *August* 4, 1540, began his first Studies at *Bordeaux*, and having continued them for some Time after, under the Instruction and Conduct of his Father, he came to *Paris*, and followed his Studies in that University. He learnt the *Greek Tongue* under *Adrianus Turnebus*, and perfected himself in the *Hebrew* by his own Study; but, above all, he excelled in critical Learning. The Curators of the University of *Leyden* invited him to be an honorary Professor in that University, where he lived sixteen Years. He likewise distinguished himself by his eminent Skill in astronomical and mathematical Studies: So that he was esteemed, the great Prince and Patron of universal Learning. His elaborate Work, *De Emendatione Temporum*; his exquisite Animadversions on *Eusebius*; with his Canon *Isagogicus Chronologiæ*; and his accurate Comment upon *Manilius's Astronomicon*, sufficiently evidence his Knowledge in the Astronomy, and other Branches of Learning, among the Antients, who, according to the Opinion of the celebrated *Vieta*, was far superior to any of that Age. The same is likewise reported of him by the learned *Casaubon*, Epistle 586. He wrote *Cyclometrica et Diatriba de Equinoctiorum Anticipatione*: He likewise wrote Notes upon *Seneca*, *Varro*, and *Ansonius's* Poems: But that which above all Things renders the Name of *Scaliger* memorable to Posterity is, the Invention of the *Julian Period*,
which

which consists of 7980 Years, being the Product of the Cycle of the Sun 28, the Cycle of the Moon 19, and the Cycle of Indiction 15. This Period had its Beginning fixed to the 764th Year before the Creation, and is not yet completed, and comprehends all other Cycles, Periods, and Epochas, and the Times of all memorable Actions and Histories; and therefore is not only the most general, but the most useful of all Periods in Chronology. He died *January 21, 1609.*

The LIFE of EDWARD WRIGHT.

EDWARD WRIGHT was Cotemporary with Mr. Briggs. Having spent some Time in the University of Cambridge, and being naturally addicted to mathematical Studies, was prevailed on to accompany the Right Hon. George, Earl of Cumberland, in his Expedition to the *Azores* in the Year 1589, on Purpose to add the Practice of Navigation to the Theory; and in the Year 1599, he published his Book called, *the Errors of Navigation corrected*, a most excellent Work, for the true describing a Sea Chart: Which Invention of his, *Gerrard Mercator* published, without owning the Author. This is the Account usually given by Biographers; but it appears not strictly true, from the Account which Mr. *Wright* himself gives of this Affair, which seems rather to intimate the contrary, viz. that he stole it from *Gerrard Mercator*; at least, he tells us, he was accused of so doing; or that it was suggested against him, that his Chart had been before published both by *Gerrard Mercator* and *Iodocus Hondius*, in their Maps of the World and of *Europe*. In answer to this Charge, he acknowledges, that it was by the Occasion of *Mercator's* Map that he first thought of correcting so many, and such gross Errors and Absurdities as he found in the common Chart; but he denies that he learnt the Method of doing this either from *Mercator*, or any one else. And as to *Iodocus Hondius*, his own Letters to Mr. Briggs are sufficient to shew, that whatever he published, in regard to his Corrections in the Maps, were taken entirely from Mr. *Wright*. Those Errors indeed were much complained of by the first Writers on
Navigation

Navigation, as *Martin Cortese*, *Peter Nonius*, *Gerrard Mercator*, and others; but *Mr. Wright's* Book was the first in which the Reasons of any Corrections appeared, and a Table of meridional Parts for constructing what is commonly called *Mercator's Chart*, which has afforded the greatest Improvement that ever was made in Navigation, and must, in Justice, be ascribed to *Mr. Wright*, especially as to all that regards the *Rationale* of it. Before the Publication of this Work, in the Years 1594, 1595, and 1596, he, by a large Quadrant of six foot Radius, made Observation of the Sun's meridian Altitude, and thereby left not only the best Theory of the Sun's Motion at that Time, but made new and very curious Tables for the Sun's Declination. He maintained a Correspondence with the most able Artists abroad, and being chosen Tutor in the Mathematics to Prince *Henry*, he, by the Help of some *German Workmen*, caused to be made, for that hopeful Prince, a large Sphere with curious Movements, which, by the Help of Spring-work, not only represented the Motions of the whole celestial Sphere, but shewed likewise the particular Systems of the Sun and Moon, and their circular Motions, together with their Places and Possibilities of eclipsing each other; there is in it a Work for a Motion of 17100 Years certainly effected, if the Sphere should be so long kept in Motion. This Sphere, tho' thus made at a great Expence of Money and ingenious Industry, was in the late Times of Devastation cast aside, among other Rubbage, and had been utterly lost and destroyed had it not, in the Year 1646, been found out by Sir *James Moore*, and at his great Cost and Charge, restored to its pristine Perfection; and was not long since at his House in the *Tower*, amongst other mathematical Instruments and Curiosities in his Possession. Besides the Book of the Errors in Navigation, before mentioned, the said *Mr. Wright* wrote a Book of the Use of the Sphere, a Piece of Dialling, and a Book of Navigation called, *the Haven-finding Art*. In all which he hath shew himself not only sedulous, but a knowing Astronomer. He flourished about the Year 1624.

The LIFE of RENE DES CARTES.

RENE DES CARTES, one of the most eminent Philosophers and Mathematicians of the seventeenth Century, was descended of an antient and noble Family in *Touraine* in *France*, and younger Son of *Joachim Des Cartes*, Councillor in Parliament of *Rennes*: He was born at *La Haye* in *Touraine*, *March* 31, 1596; his Mother died soon after his Birth, and his Father married some Years after; but from an Appearance of a promising Genius as well as a paternal Affection, did not at all neglect his Education, frequently calling him the Philosopher, on Account of his insatiable Curiosity in asking the Reasons of every Thing that he did not apprehend. He was sent to the *Jesuits* College at *La Fleche* in 1604, and put under the Tuition of Father *Charlet*: Here he made a great Progress in the learned Languages and polite Literature, and contracted an Acquaintance with several Gentlemen, eminent in the Republic of Letters; but having passed thro' his Course of Philosophy without any great Satisfaction to himself, he left the College in *August* 1612, intending to decline his Studies, and began to addict himself to military Exercises, in learning to ride the great Horse and to Fence, and other such like Actions suitable to his Quality; but notwithstanding his Inclination to military Atchievements, the Weakness of his Constitution not permitting him early to expose himself to the Fatigues of War, he was sent to *Paris* in the Spring under the Care of a Tutor or Companion, under no other Restrictions than consisted with Virtue and Quality: Here he renewed his Acquaintance with several Persons who served to reclaim him from his Intention to decline his Studies, particularly Father *Mersenne*, whose Conversation revived in him a Desire after Truth, and tho' his Father removed soon after to *Nevers*, the Impressions were so strong that he did not return to his former Diversions; but, inspired with the Love of Knowledge, he entered upon a severe Course of Study, which he pursued till he was found out by some of his Friends and dissuaded from it. He then departed for *Holland*, *May* 1616, and enlisted himself in the Prince of *Orange's* Troops as a Volunteer, and while he

lay in Garrison at *Breda*, during the Truce between the *Spaniards* and the *Dutch*, solved a Problem in the Mathematics to the Satisfaction of *Isaac Beekman*, Principal of the College of *Dort*. A Person unknown caused the Problem to be fixed up in the Streets of *Breda*, which occasioned a great Resort of Persons to visit him and seek an Acquaintance with him, which was greatly encouraged by Mr. *Isaac Beekman*, who was more than thirty Years older than *Des Cartes*. During his Stay at *Breda* he likewise wrote a Treatise of Music, and laid a Foundation for many of his other Works. He left *Breda* in 1619. In the Spring following he attended the Duke of *Bavaria's* Army, in which he had entered as a Volunteer, into *Swabia*, and arrived at *Ulm* 1620, where he became acquainted with *John Faulhaber*, who encouraged him in the Study of Mathematics: He was present at the Siege of *Prague*, *Presbourg*, *Tinaw*, &c. but the raising of the Siege of *Dew-Hausel* with the Loss of his General who was killed there, determined him to abandon the Profession of Arms. Then he began his Travels into the North, visited *Silesia*, *Poland*, *Pomerania*, the Coast of the *Baltic*, *Brandenburg*, *Holstein*, *East* and *West Friesland*, from thence went into *Holland*, and then to *Rennes* in *France*, then to *Bretagne* and *Poitou*, where he sold his Estate, and prosecuted his Travels through *Switzerland*, *Italy*, &c. Upon his Return home, 1628, he attempted to conceal himself, but, being known to be returned, Men of Learning in the Sciences sought to divert him from too secluse a Life. The Pope's Nuncio prevailed upon him to explain his Sentiments with regard to Philosophy, for which Purpose our Author retired to *Amsterdam* in 1629, and from thence to *Friesland*, where he began his metaphysical Meditations; but that he might undertake nothing that had any Affinity with Divinity, he considered God only as the Author of Nature, and it was not natural Religion, but revealed, that he excluded from his Designs. During his Stay in *Friesland* he spent some Time in Dioptrics, to which he applied himself in *France*. About six Months after he returned again to *Amsterdam*, where he resumed his Studies with great Assiduity in the Mathematics. Here he likewise drew up his Discourse of Meteors, and soon after he seriously undertook the Study of Physic, Anatomy and Chemistry, as he conceived nothing was more capable of promoting the

the temporal Felicity of Mankind than an happy Union of Physic with Mathematics; He began this Study with that of Anatomy, in which he spent his Time all the Winter he resided at *Amsterdam*, and rejected an Invitation of going into the *Levant* with Count *De Marchivell*, Embassador from the King of *France* to the *Grand Seignior*; but soon after took a Tour to *England*, and not far from *London* made some Observations concerning the Declination of the Magnetical Needle. Upon his Return he admitted Monsieur *Ville-Bressieux*, who had a prodigious Genius for the Mathematics and Chemistry, into his Family; and in the Spring of the Year 1633 he removed to *Deventer*, where one of his own Disciples was appointed Professor of Philosophy. Here he applied himself to compleat several Works which he had left unfinished the Year before, and resumed his Studies in Astronomy, and the Summer following finished his Treatise of the World: He called it his World, because it was the Idea of a World which he had imagined answerable to the World in which we live, and it contained an Abridgment of all his natural Philosophy, that is, of all that he could come to the Knowledge of with regard to material Things, except what relates to Light, which he proposed to explain afterwards in its full Extent. The next Year he removed to *Amsterdam*, and soon after took a Journey into *Denmark* and the lower Parts of *Germany* with Monsieur *Ville-Bressieux*. The Winter following afforded our Author an Opportunity for those Observations which he made upon Snow of six Points or Angles, and upon that Occasion to make others upon Hail and Rain, in five Discourses. He afterwards wrote a sixth Discourse of them, published in his Treatise of Meteors. In 1635 he went to *Lewarden* in *Friesland*, where he continued to the Year 1637, and wrote his Treatise of *Mechanics*. He returned to *Amsterdam* about the Middle of *March*, and made a great many curious Observations concerning the Circles about Candles, &c. In 1637 he published his four Treatises concerning Method, Dioptrics, Meteors, and Geometry: He soon after took a Journey to *Breda*; at his Return he settled at *Egmond*, where, notwithstanding he had not attempted to undermine the Catholic Religion, his Book produced some Objections, which he was called upon to answer, viz. by *Fromond*, *Regius* Professor of the Holy Scriptures at *Lovain*; *Plempius* a Dutch Physician in
that

that University; and Monsieur *Morin*, *Regius* Professor of Mathematics in the *Jesuits* College there. In *France* his Book was received according to the different Sentiments of the Readers. The Disputes which he had with the *Regius* Professor of Mathematics at *Paris*, and Monsieur *Beaugrand*, Secretary to the King of *France*, terminated very amicably; nevertheless, he resolved to discontinue his Application to abstract Geometry, though he determined to continue that Part of it which is conversant about the Phænomena of Nature, and wrote a Book to explain some Parts which were somewhat obscure, and consented that a *Dutch* Gentleman should draw up a regular Introduction to his Geometry, to facilitate the Understanding of it to all his Readers. After having his Patience tried with Problems, &c. about the Year 1638, he desired to be excused from answering any more, and to avoid it he drew up a Series of the most useful Problems with their Solutions, in order to be printed. His Philosophy now grew much in Esteem; and by the Influence of *M. Renneri*, and *Henry Regius* a Physician in much Esteem, the University of *Utrecht*, declared likewise in its Favour, but was afterward vehemently attacked by *Gilbert Voetius*, Professor of Divinity in *Holland*. *Des Cartes* now removed to *Harderwick* near *Utrecht*, and thence to *Leyden*, and not long after was invited to settle in *England*, by Sir *Charles Cavendish*, Brother to the Earl of *Newcastle*. About this Time he was violently attacked by some *Jesuits*, and particularly by Father *Bourdin*. At the latter End of the Year 1641, *Lewis XIII.* King of *France*, invited him to his Court upon very honourable Conditions, but there was no Sollicitations powerful enough to prevail upon him to part with his present happy Retirement. In 1641 he published his Meditations concerning the Existence of God, and the Immortality of the Soul. *Voetius* being chosen Rector of the University of *Utrecht* in the same Year, he wrote against him, and procured his Philosophy to be prohibited there; whereupon *Des Cartes* published a Vindication of himself, printed at *Amsterdam* in 1643; but in this he was greatly censured for treating his Opponent with too much Rancour and Scurrility. The same Year he took a Voyage into *France*, where he found the Edition of his Principles, and *Latin* Translation of his Essays finished, and the Copies sent from *Holland*: He dedicated his

Princi-

The Life of RENE DES CARTES. 261

Principles to his illustrious Disciple, *Elizabeth*, Princess Palatine and Queen of *Bohemia*: After paying Visits at *Paris*, he departed for *Holland*, about the End of *October*, and retired to *Egmond*, with a Resolution to apply himself wholly to the Knowledge of Animals, Plants, and Minerals. — In *June*, 1645, he publicly renounced his Disciple *Regius*, who had presumed to advance several Notions of his own, and had artfully possessed himself of *Cartes's* Treatise of Animals. He then directed his Application with fresh Vigour to Anatomy; and being visited at this Time by a Gentleman who desired to see his Library, he shewed him nothing but a Calf, which he was about to dissect. He was a little diverted from this Study, by the Question concerning the Quadrature of the Circle, agitated in 1645, between *Longomontanus*, and Mr. *John Pell*; which Question he declared impossible to be solved. He passed the severe Winter of that Year at *Egmond*, and composed two Books, one against *Gassendus's* Instances, and another on the Nature of the Passions: About the same Time he had a Dispute with Monsieur *Roberval*, concerning Vibrations, and carried on a Correspondence upon Moral Philosophy, with the Princess *Elizabeth*. In the Beginning of the Year 1647, he answered some Questions proposed to *Christiana*, Queen of *Sweden*, and Monsieur *Chanut*, the Resident of *France* in that Kingdom: But the Pleasure of this Correspondence was disturbed by the Clamours which *Ravius*, Principal at the College of *Leyden*, and *Triglianus*, Professor of Divinity there, had raised against his Philosophy in that University: They were soon after enjoined Silence with regard to him, tho' they afterwards wrote against some Parts of his Philosophy. In *June*, he took a Journey to *France*, where the King settled on him a Pension of 3000 Livres; and he returned again to *Holland* about the End of *September*. In *November* he received a Letter from Monsieur *Chanut*, desiring, in Queen *Christiana's* Name, his Opinion of the sovereign Good, which he sent her with some Letters which he had formerly written to the Princess *Elizabeth*, upon the same Subject, and his Treatise of the Passions: The Queen was so highly pleased with them, that she wrote him a Letter of Thanks with her own Hand. In *May* following, he took a third Journey into *France*, where *Gassendus* and he were reconciled; And in *September* he returned to *Egmond*, where the

Queen of *Sweden* having invited him into that Kingdom, he went, and was received with the highest Civility by her Majesty, who engaged him to attend her every Morning at five o'Clock, to instruct her in his Philosophy, and desired him to correct and revise all his Works, and to form a compleat Body of Philosophy from them: She proposed likewise to settle him in *Sweden* upon very honourable Terms, and to allow him a Revenue of 3000 Crowns *per Annum*, with an Estate which should descend to his Heirs, and to establish an Academy, of which he should be the Director: But all these Designs were obstructed by his Death, which happened *February 11, 1650*, he being then fifty-three Years and ten Months old. His Body was interred at *Stockholm*, and seventeen Years afterwards removed to *Paris*, where a magnificent Monument was erected to him in the Church of *St. Genevieve*. Monsieur *du Mont* has given us a particular Account of the Qualifications of his Mind and Body, and highly recommends him for his Contempt of Wealth and Fame, his Love of Truth, his singular Modesty, disinterested Moderation, Piety, and Submission to the Authority of the Church: But we shall chuse to give his Character from Dr. *Barrow*, and other Authors of Note. Dr. *Barrow*, in his *Opuscula*, Page 156, tells us, “ That he was undoubtedly a very good and
 “ ingenious Man, and a real Philosopher, and one who seems
 “ to have brought those Assistances to that Part of Philosophy
 “ which relates to Matter and Motion, which perhaps no other
 “ had done: That is, a great Skill in Mathematics; a Mind habi-
 “ tuated, both by Nature and Custom, to profound Meditation;
 “ a Judgment exempt from all Prejudices and popular Errors, and
 “ furnished with a considerable Number of certain, and select
 “ Experiments; a great deal of Leisure; entirely disengaged,
 “ by his own Choice, from the Reading of useless Books, and
 “ the Avocations of Life; with an incomparable Acuteness of
 “ Wit, and an excellent Talent of thinking clearly and dis-
 “ tinctly, expressing his Thoughts with the utmost Perspicuity.”
Samuel Moresius, *Alexander Morus*, *Morhoff*, *Bullart*, and many other foreign Writers speak of him with great Commendation. And the great Dr. *Edmund Halley*, in a Paper concerning Optics, communicated to Mr. *Wotton*, writes thus: “ As to Di-
 “ optrics, tho’ some of the Ancients mentions Refraction as a
 “ natural

The Life of RENE' DES CARTES. 263

“ natural Effect of transparent Media, yet, *Des Cartes* was the
“ first, who in his Age has discovered the Laws of Refraction,
“ and brought Dioptrics to a Science.” But Dr. *John Wallis*,
speaking of his Knowledge in Algebra and Geometry, says,
“ It was in great Measure owing to Mr. *Harriot*’s Book called,
“ *Artis Analyticæ Praxis*, on which the *Cartesian* Method of Al-
“ gebra was founded, there being scarce any Thing of pure
“ Algebra in *Des Cartes*, which was not before in *Harriot*; but
“ the Application thereof to Geometry, or other particular
“ Subjects which *Des Cartes* pursues, is not the Business of that
“ Treatise of *Harriot*.”

We shall only add to the above Account, that his Principles of Philosophy were not only arbitrary, imaginary, groundless, and insupported by any Experiments, or mathematical, or mechanical Reasoning; but were soon found to be absurd and contrary to the known, and established Laws of Nature: And it is happy for the present Age, that his Vortices has hurled away his *Materia Subtilis*, beyond the Extent of the solar System: And it may be said of his, as of the *Hutchinsonian* Philosophy, that it had never any Abettors or Admirers, but among those who were never qualified to understand any true Philosophy at all: And *Jacob Bremen* might as well have been compared, or paralleled with Sir *Isaac Newton*, in regard to Philosophy, as *Des Cartes*. In short, the Sum of his Character may be reduced to this, that he was a very great Mathematician, but made the least Use of his Skill of that Sort, where it was most required, and the fairest Opportunity offered, viz. in his bold Attempt of making a *World*.

The LIFE of PETER GASSENDUS.

P*PETER GASSENDUS*, Dean of the Cathedral Church of *Digne* in *Provence*, and Regius Professor of Mathematics in the University of *Paris*; the learned Restorer and Vindicator of the Epicurean Philosophy: Among other lasting Monuments of his Erudition he hath left divers astronomical Tracts,
viz.

viz. four Epistles *De apparente Magnitudine Solis humilis et sublimis*. — Three, *De Motu impresso à Motore translato*, wherein he defends the *Copernican Hypothesis* of the Earth's Motion. — Another Work, he entitled, *De Parheliis, seu Solibus quatuor spuriis Romæ circa verum visis, Anno 1629*. He put forth also, about the Time of his Admission into the philosophical Chair at *Paris*, his astronomical Institutions, printed lately at *London*, with the Addition of *Kepler's Dioptrics*; and hath left, amongst other of his Works, a Volume of celestial Observations, which, from the Year 1621 to the Year 1655, he made with assiduous Care and accurate Speculation. — A Treatise also entitled, *Mercurius in Sole visus et Venus invisæ*, printed at *Paris* in the Year 1631. His Conjecture about nine pretended Satellites of *Jupiter*, in answer to *Rheita. Solstitialis Altitudo Massiliensis, seu Proportio Gnomonis ad Solstitialem Umbram observata Massiliæ 1636*, in an Epistle to *Vendelinus*. — The Lives of *Purbacchius* and *Regiomontanus*, as likewise those of *Copernicus* and *Tycho Brahe*, the most illustrious Astronomers of their Times: And a compendious Exposition of the *Roman Calendar*. Besides the Life of the incomparable *Peireskius*, and his Epistles to divers eminent and learned Persons; wherein he frequently treats, upon Occasion given, of astronomical Subjects.

One Circumstance in the Life of our Author we must not omit, the Transits of the Planets *Mercury* and *Venus*, over the solar Disk, are Phænomena of the most delightful and useful Kind; they were never observed till after the Use of Telescopes: The first who ever saw the Transit of *Mercury* was *Gassendus*, and *Horrox* first predicted and shewed the Transit of *Venus*. *Kepler*, whose Life we have given, Page 214, before he had finished his Tables; had placed the Nodes of *Mercury's* Orbit at the Beginning of the Signs of *Gemini* and *Sagittary*, and thence predicted his Appearance in the Sun, *May 20, 1607*, on which Day he observed the Sun very diligently, viewing his Image cast upon a Paper in a dark Room, thro' a small Hole in the Window shut; then also there happened to be a large Spot in the Sun, which *Kepler* took for *Mercury*. It was lucky for him that Telescopes were invented soon after, which presently convinced him that what he took for *Mercury* was only a solar Spot; upon this he rectified his Tables, and by placing the Nodes of *Mer-*

The Life of CHRISTOPHER SCHEINERUS. 265

cury about the Middle of *Taurus* and *Scorpio*, he predicted, that his first Appearance in the Sun would be on the 7th of *November*, 1631.

Gassendus was then at *Paris*, and made due Preparation to observe it in the Manner he used to observe Spots upon the Sun, by receiving its Rays thro' a Telescope, a little lengthened, in order to collect them into an Image cast upon white Paper; and in watching for *Mercury*, he fell into a contrary Mistake to that of *Kepler*, taking *Mercury* himself for a solar Spot just sprung from the Sun, having found it quite free from them the Day before: However, he took the Position of the Spots once or twice, intending to compare it with that of *Mercury*, which he thought would appear much larger; but in taking its third Position, and observing it moved quicker than Spots usually do, he began to suspect it might be *Mercury* himself; and being farther assured of it by his fourth Observation, he prepared to observe its Egress from the Sun's Disk, which happened on the 7th of *November*, 20 Minutes after ten in the Morning, at the Distance of $33\frac{1}{2}$ Degrees from the Sun's vertical Point: This was the first Time that *Mercury* was ever seen in the Sun, and the only Observation then made of that Transit; several subsequent Observations of the like Transits have been made by other Authors.

His Library was large and valuable: To which he added, an astronomical and philosophical Apparatus, which, for their Accuracy and Worth, were purchased by the Emperor *Ferdinand* III. and since by the present Emperor of *Germany*, and deposited, with other valuable Collections, in the Emperor's unparalleled Library at *Vienna*. He died, greatly regretted by all who had the Happiness of his Acquaintance, in the Year 1655.

The LIFE of CHRISTOPHER SCHEINERUS.

CHRISTOPHER SCHEINERUS, a Native of *Mundeilhen* in *Swaben*, of the Society of *Jesus*, and sometime Professor of the *Hebrew* Tongue, and Mathematics, at *Fribourg* and *Ingolstadt*, afterwards Rector in the College of *Nissa*,

displayed a remarkable Genius in astronomical Sciences. He discovered the Spots in the Sun about the same Time as *Galileo*, and he attended to the Observation of the solar Spots for many Years at *Rome*, with the greatest Assiduity and Sagacity, and constantly made Drawings of the same on Paper, describing their Places, Figures, Magnitude, appearing and disappearing Revolutions, and Periods, which he so plainly transmitted to Posterity, that *Ricciolus* delivered it as his Opinion, that we had little Reason to hope for better Observations than he has left us. — *Des Cartes*, and *Hevelius*, also says, that according to their Judgment, nothing can be expected of that Kind more Satisfactory. — Mr. *Heathcote*, in his History of Astronomy, makes particular mention of this Author, and says, that he discovered the solar Spots in the Year 1611; and he was certainly the first Author that published any Thing considerable on that Subject; for which Reason, principally, we think him worthy a Place in our *Biographia*.

The most eminent Pieces by which he hath signalized his Name, are these:

- I. *Oculus, seu fundamentum opticum.*
- II. *Sol ellipticus, disquisitiones mathematicæ.*
- III. *De controversiis et novitatibus astronomicis.*
- IV. *Rosa ursina.*

He died at *Rome*, about the Year 1630.

The LIFE of PHILIP LANSBERGIUS.

PHILIP LANSBERGIUS had a Rank amongst the Mathematicians of the seventeenth Century. He was born in *Zealand*, in the Year 1561, and was Minister of the Gospel at *Antwerp* in the Year 1586, and afterwards for several Years; *Vossius* mentions, that he was Minister at *Goesse* in *Zealand* 29 Years; and being then discharged of his Functions, on Account of his old Age, he retired to *Middleburgh*, where he died in the Year 1632. His

The Life of PHILIP LANSBERGIUS. 267

His Works were principally the following :

I. Six Books of sacred Chronology ; printed in the Year 1626.

II. Essays on the Restitution of Astronomy ; printed at *Middleburgh*, 1629.

III. Four Books of geometrical Triangles ; printed in the Year 1631.

IV. Of Measuring the Heavens, in three Books, in the same Year.

V. An Account of the diurnal and annual Motion of the Earth and of the true Situation of the visible celestial Bodies. In this Work he declares himself openly for *Copernicus's* System, and even pretends to improve it. He composed this Work in *Dutch*, and it was translated into *Latin*, by *Martinus Hortensius*, and printed at *Middleburgh*, 1630. *Fromond*, a Doctor of *Louvain*, wrote an Answer to it, and endeavoured to prove the Earth stood still. He did not live to write a Reply to it, but his Son published an Answer to *Fromond*, and *Morin*, *Regius* Professor at *Paris*, and to *Peter Bartholinus*, which is entitled, *A Defence of the Account, &c.* by *James Lansbergius*. This was also answered ; but we don't find which Side gave out first.

The LIFE of HENRY GELLIBRAND.

HENRY GELLIBRAND was born in the Parish of *St. Botolph, Aldersgate*, in the City of *London*, on the 27th of *November*, 1597 ; and in the Year 1615 he was admitted a Commoner at *Trinity College* in *Oxford*, where, about four Years after, he took the Degree of Bachelor of Arts : Soon after, upon hearing one of *Sir Henry Saville's* mathematical Lectures, he was so extremely taken with it, that he immediately fell to the Study of that noble Science, and made a considerable Proficiency before he took his Masters Degree, which was in the Year 1623. While he continued in the Pursuit of those Studies, the Professorship of Astronomy in *Gresham College* becoming vacant by the Death of *Mr. Gunter*, he endeavoured

endeavoured to succeed him, and for that End procured a Testimonial from the President and Fellows of *Trinity College*, which being presented to the Electors, he was chosen the 2d of *January*, 1626: But Mr. *Gellibrand* had not been settled there many Years before (as Mr. *Prynne* informs us) he was brought into Trouble in the High Commission Court, by Dr. *Laud*, then Bishop of *London*, upon the Account of an Almanac, published by *William Beale*, Servant to Mr. *Gellibrand*, for the Year 1631, with the Approbation of his Master. In this Almanac the *Papish* Saints, usually put into our Kalendar, were omitted, and the Names of other Saints and Martyrs, mentioned in the Book of Martyrs, were placed in their Room, as they stand in Mr. *Fox's* Kalendar. This it seems gave Offence to the Bishop, and occasioned the Prosecution: But when the Cause came to be heard, it appearing, that other Almanacs of the same Kind had been formerly printed, both Mr. *Gillibrand*, and Mr. *Beale*, were acquitted. — Mr. *Gellibrand* was then employed in finishing the *Trigonometria Britannica* of Mr. *Briggs*, which was designed by the Author to consist of two Books; but he dying on the 26th of *January*, 1630, when he had completed only the first of them, recommending it to the Care of his old Friend Mr. *Gellibrand*, to draw up the second, and complete the Work. Several other Persons, also eminent for their Skill in the Mathematics, were earnest with him to engage in this Design, which he having undertaken and finished, was printed in *Holland*, 1633. He likewise published a Discourse on the Variation of the magnetic Needle, and annexed a Treatise of Mr. *Edward Wright's*, entitled, *Certain Errors in Navigation, detected and corrected*. Those Observations had been made partly by *Englishmen*, and partly by Foreigners in almost all Parts of the World, where Navigation had been then carried; they have been since much esteemed, and great Use has been made of them by very eminent Mathematicians.

Mr. *Gellibrand's* Situation at the College, free Converse with the Lovers of mathematical Studies, and diligent Enquiries gave him an Opportunity of contributing much to the Improvement of Navigation, which probably would have owed more to him, had he lived longer: But he was taken off *February* 9 1636, in the 40th Year of his Life, and was buried in the

Church

Church of *St. Peter the Poor*, without any Inscription to his Memory: *Dr. Hanibal Potter*, formerly his Tutor at *Trinity College*, and afterwards President of it, preached his funeral Sermon, in which he much commended his Piety and Worth. There is a Dial made by him, which yet remains on the East Side of the old Quadrangle in that College; but the best Memorial of him are his Writings, *viz.*

I. His *Trigonometria Britannica*: Or, the Doctrine of Triangles.

II. A small Tract concerning Longitude.

III. A Discourse on the Variation of the Magnetic Needle.

IV. An Institution of Trigonometry, with its Application to Astronomy and Navigation.

V. An Epitome of Navigation, with the necessary Tables.

VI. Several MSS. never published, as the Doctrine of Eclipses. — A Treatise of Lunar Astronomy. — A Treatise of building Ships, &c.

The LIFE of SAMUEL FOSTER.

SAMUEL FOSTER was born in *Northampton*, and admitted a Sizer at *Emanuel College, Cambridge*, on the 23d of *April*, 1616, where he took the Degree of Bachelor of Arts in the Year 1619, and that of Master in 1623: The Year following he published his Treatise, called *The Use of the Quadrant*. He never had a Fellowship, and is therefore placed, by *Mr. Fuller*, among the leaned Writers of that College who were not Fellows.

His Inclination led him chiefly to the Mathematics; and upon the Death of *Mr. Gellibrand*, Astronomy Professor in *Gresham College*, he was chosen in his Room, upon the 2d of *March*, 1636; but quitted that Place on the 25th of *November* following, and was succeeded by *Mr. Murray*.

After the Surrender of his Professorship, he continued to pursue his mathematical Studies; and in the Year 1638 he published

ed his *Art of Dialling*. But, in the Year 1641, that Professorship being vacant again by the Marriage of Mr. *Murray*, he was again re-chosen, *May* the 26th, that Year. And upon the breaking out of the national Troubles, which soon followed his Return to *Gresham* College, he was one of that worthy and learned Society of Gentlemen who met in *London*, and applied themselves to experimental Enquiries, and the Study of Nature, which was then called *the New Philosophy*, and at Length gave Birth to the *Royal Society*. In 1646, Dr. *Wallis*, who associated with them, received from Mr. *Foster* a Theorem, *De Triangulo Sphærico*, which he afterwards published. The happy Effects of those Meetings, both at *London* and *Oxford*, were very great and extensive; though Mr. *Foster* had not the Pleasure of seeing it, for he died at *Gresham* College in the Month of *July*, 1652, and was buried in the Church of *St. Peter the Poor* in *Broad-Street*.

Dr. *John Twysden* gives him the Character of a learned, industrious, and most skillful Mathematician; the Truth of which he has abundantly shewn by his Works: Nor did he only excel in his own Faculty, but was likewise well versed in the antient Languages, as appears by his revising and correcting the *Lemmata* of *Archimedes*, which had been translated into *Latin* from an *Arabic* Manuscript, but not published, by Mr. *John Greaves*. He made several curious Observations of Eclipses, both of the Sun and Moon, as well at *Gresham* College as in other distant Places: And he was particularly famous for inventing and improving many planetary Instruments. He published but little himself; but many Treatises, written by him, were published after his Death, though, as Dr. *Twysden* and Mr. *Wingate* says (to whom the Public is obliged for them) being disabled, by his great and long Infirmities, to fit them for the Press as he desired and intended, they must needs want very much of that Accomplishment, which otherwise they would have had; and Dr. *Twysden* complains, that some Persons, having got into their Hands some Things of Mr. *Foster*'s, which, out of that diffusive Goodness and Candor of Disposition that was in him, he communicated to others, had, under a disguis'd Face, vented them as their own. His Works are most of them still extant, and very useful. The principal of which here follow:

I. The

I. The Use of *Gunter's* Quadrant.

II. The Art of Dialling.

III. His posthumous Works, published by Mr. *Wingate*.

IV. Four Treatises of Dialling. Containing the Nature of elliptical, circular, rectilineal and azimuthal Dials.

V. Miscellanies, or mathematical Lucubrations.

VI. The Sector altered and improved, with an Addition of other Scales.

To which we may add, a MSS. Treatise, in Folio, on the Uses of a general Quadrant, invented by Mr. *Samuel Foster*.

The LIFE of JEREMIAH HORROX.

JEREMIAH HORROX, an eminent *English* Astronomer in the seventeenth Century, was born at *Toxteth* near *Liverpool* in *Lancashire*, about the Year 1619, and, when but very young, was placed under the Care of a School-master in the Country, where he made himself Master of Grammar Learning; but, as he discovered a remarkable Genius, he was sent to *Emanuel* College in *Cambridge*, and spent some Time there in academical Studies. About the Year 1633, he began to apply himself to the Study of Astronomy; but living at that Time with his Father at *Toxteth*, in very moderate Circumstances, and being destitute of proper Books and Assurances for the Prosecution of this Study, he could not make any considerable Progress in it: But having spent some Years to little Purpose, in the Study of *Lansbergius*, he renews his Application to the Study of *Tycho Brahe*, *Kepler*, and other excellent Writers. And, about the Year 1636, he contracted an Acquaintance and Friendship with Mr. *William Crabtree*, who was engaged in the same Studies, and who lived at *Broughton* near *Manchester*, who carried on a mutual Correspondence for a considerable Time, and sometimes communicated their Improvements to Mr. *Samuel Foster*, Professor of Geography at *Gresham* College in *London*. Mr. *Horrox*, having now obtained a Companion in
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his Studies, assumed new Vigour, and procured astronomical Instruments and Books, applied himself to the making many curious Observations which had never been made before, and was pursuing his Studies with great Assiduity, when he was removed, by sudden Death, the 3d of *January*, 1640, in the 22d; or at the Entrance of the 23d Year of his Age, according to the Account given us by Dr. *Wallis*:

What we have extant of his Writings, gives us some Idea of the great Loss the World had by his Death. He had just finished his *Venus in Sole Visa*, a little before his Death; for it appears by a Letter of his to Mr. *Crabtree*, dated *October* 3d, 1640, that this Book was not then finished; and in another Letter of the 19th of *December*, he intimates, he had finished it, and should set out on the 4th of *January* to see him; but died the Day before.—— Our Author made his Observations of *Venus in Sole* at *Hool* near *Liverpool*, as is evident from his Letters. This most excellent *Traëtate of Venus seen in the Sun*, was published by the famous *Hevelius*, together with his own *Mercurius in Sole Visus*, and illustrated with his accurate Annotations; his other posthumous Works, or rather his imperfect Papers, were digested and published by the great Care and Labour of that learned Mathematician Dr. *John Wallis*, wherein we find, he first asserts and promotes the *Keplerian* Astronomy against the Hypothesis of *Lansbergius*, which he proves to be inconsistent with itself; not agreeable to former Observations exactly made, nor the Precepts of them well demonstrated. He likewise reasons, with great Justice, concerning the celestial Bodies and their Motions, vindicates *Tycho Brahe* from some Objections made to his Hypothesis, and gives a new Theory of the Moon: To which are added, the lunar Numbers of Mr. *Flamsteed*. There are also Extracts of several Letters of his, to his Friend and Associate in Study, Mr. *Crabtree*, upon diverse astronomical Subjects; with a Catalogue of astronomical Observations, made by the said *Horrox*, without Allowance of the Excentricity of the Eye, concerning which he afterwards altered his Sentiments, as appears by a Correction fairly written with his own Hand.

There are two Things which will eternize the Memory of this great, though very young Man; one is, that he was the first that ever predicted, or saw the Planet *Venus* in the *Sun*; and, indeed, we do not find that any but himself and Mr. *Crabtree*, of all Mankind, ever beheld such a Phænomenon. Tho' he was not apprized of the grand Use that was to be made of it, in discovering the Parallax and Distance of the Sun and Planets, yet he made many useful Observations, Corrections, and Improvements in the Theory of *Venus's* Motion from thence.

2dly, His new Theory of lunar Motion, which Sir *Isaac Newton* himself made the Ground-work of all his Astronomy, relative to that secondary Planet, and always spoke of our Author as a Genius of the first Rank. — His posthumous Works, above-mentioned, will furnish the Reader with many excellent Treatises on astronomical Subjects, which, tho' they are much improved since his Time, were then far surpassing any Thing that had before been published by others, and are still worthy the Perusal of the best Judges in that Science.

The LIFE of JOHN WALLIS.

JOHAN WALLIS, Son of Mr. *John Wallis* a Clergyman, was born at *Ashford* in *Kent*, November 23, 1616: His Father dying when he was but 6 Years old, he was put under the Care of Mr. *James Movat*, a *Scotchman*, and trained up in his School at *Leygreen*, near *Tenterden*, till about the Year 1630, when he was sent to *Felstead* School in *Essex*, under the Direction of Mr. *Martin Holbeach*, and was instructed by him in the *Latin*, *Greek*, and *Hebrew* Tongues, and the Rudiments of *Logic*, *Music*, and the *French* Language. Thus accomplished; about 1632, he was sent to the University of *Cambridge*, where he was admitted of *Emanuel* College, under the Tuition of Mr. *Anthony Burgessthen*, of Mr. *Thomas Horton*, and afterwards of Mr. *Whicheot*: Under these famous Tutors he made a great Progress in Learning, was, soon after his Admittance to *Emanuel* College, chosen of the Foundation, and admitted a Scholar of

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the House. Mr. *Wallis*, after this, removed to *Queen's College, Cambridge*, where he was chosen Fellow, and continued so till, by his Marriage, he vacated his Fellowship. On this Account, in 1636, he took the Degree of Bachelor of Arts, and, about four Years after that, of Master. The same Year, 1640, he took holy Orders from Dr. *Walter Curle* of *Winchester*, but quitted the College to be Chaplain to Sir *Richard Darby* in *Yorkshire*; after, he removed into that of the Lady *Vere*. The next Year he was chosen one of the Scribes, or Secretaries to the Assembly of Divines at *Westminster*; and on the 4th of *March*, 1645, he married *Susanna*, Daughter of *John* and *Rachael Glyde*, of *Northiam* in *Suffex*. Soon after, he came to reside at *London*, at a Time when, by the Civil Wars, academical Studies were much interrupted in both Universities, and in that City. He had great Opportunities, by an Acquaintance with many worthy Persons, of improving his Mind in the Knowledge of natural and experimental Philosophy. “We did, says he, in a Letter to Dr. *Smith*, meet weekly in *London*, to treat and discourse of such Affairs; of which Number were Dr. *John Wilkins*, Dr. *Jonathan Godard*, Dr. *Samuel Foster* when Professor of Astronomy at *Gresham College*, Mr. *Theodore Naak* of the *Palatinate*, &c. &c. These Meetings we held sometimes at Dr. *Godard's* Lodgings in *Woodstreet*, or some convenient Place near, on Account of his keeping an Operator in his House for grinding Glasses for Telescopes and Microscopes, &c. Our Business was (precluding Matters of Theology and State Affairs) to discourse and consider of philosophical Enquiries, and such as related thereunto, as Physic, Anatomy, Geometry, Astronomy, Navigation, Statics, Magnetism, Chymics, Mechanics, and natural Experiments, with the State of these Studies as then cultivated abroad and at home. We there discoursed of the Circulation of the Blood, the Valves in the Veins, the lymphatic Vessels, the Nature of Comets and new Stars, the Satellites of *Jupiter*, the oval Shape (as it then appeared) of *Saturn*, the Spots in the Sun, and its turning on its own Axis, the Inequalities and Selenography of the Moon, the several Phases of *Venus* and *Mercury*, the Improvement of Telescopes and grinding of Glasses for that Purpose; the Weight of Air, the Possibility or Impossibility of Vacuities, and Nature's Abhorrence thereof; the *Tor-*

vicellian Experiment in Quick-silver, the Descent of heavy Bodies, and the Degrees of Acceleration therein, and diverse other Things of the like Kind ; many of which were new Discoveries at that Time, and others not so generally known and embraced as now they are ; with other Things appertaining to what has been called the *New Philosophy*, which, from the Time of *Galileo* at *Florence*, and *Sir Francis Bacon*, *Lord Verulam*, in *England*, hath been cultivated in *Italy*, *France*, *Germany*, and other Parts abroad, as well as with us in *England*."

"About the Year 1648, some of our Company being removed to *Oxford*, first *Dr. Wilkins*, then I, and soon after *Dr. Godard*, our Company divided ; those in *London* continued their Meeting there, as before, and we with them when we could be there ; and those of us, at *Oxford*, with *Dr. Ward*, since Bishop of *Salisbury*, *Dr. Bathurst*, *Dr. Petty*, *Dr. Willis*, then an eminent Physician in *Oxford*, and brought those Studies into Fashion there. Our Meetings were usually at *Dr. Petty's* Lodgings, at an Apothecary's, because of the Convenience of inspecting Drugs, and the like, as there was Occasion ; and, after his removal to *Ireland*, at *Dr. Wilkins's* Lodgings ; and afterwards at *Mr. Robert Boyle's*, then Resident for diverse Years in *Oxford*. During which, the Meetings in *London* continued ; and, after the King's Return, in 1660, were increased with the Accession of diverse worthy and honourable Persons, and were afterward incorporated by the Name of *the Royal Society*."

With respect to the theological Character of this great Man, he appears to have been indefatigable in his Studies, steady and inflexible, yet moderate in his Principles ; as is evident from the many polemical Tracts which he wrote, *viz.* that of *Truth tried*, &c.

His Wisdom was very conspicuous in his Conduct in those critical Times in which he lived : Concerning which, the Doctor speaks thus of himself, "It hath been my Lot to live in a Time wherein have been many and great Changes and Alterations ; it hath been my Endeavour to act all along, by moderate Principles, between the Extremities on either Hand, in a moderate Compliance with the Powers in Being, in those Places where it has been my Lot to live, without the fierce and violent Animosities usual in such Cases, against all that did not act just

as I did, knowing that there were many worthy Persons engaged on either Side, and willing, whatsoever Side was uppermost, to promote, as I was able, any good Design for the true Interest of Religion, of Learning, and the public Good; and ready to perform good Offices as there was Opportunity; and, if Things could not be just as I could wish, to make the best of what is, and hereby, through God's gracious Providence, have been able to live easy and useful, if not great.

In 1653, he published at *Oxford*, in 8vo, a Grammar for the *English Tongue* for the Use of Foreigners, in *Latin*, under this Title; *Grammatica Linguæ Anglicanæ, cum Tractatu de Loquelâ seu sonorum formatione*. May the 31st, 1654, he took the Degree of Doctor of Divinity, which, June the 23^d, 1662, was confirmed by the Convocation. In 1655, Mr. *Thomas Hobbes* having printed his Treatise *De Corpore Philosophicò*, Dr. *Wallis*, the same Year, published a Confutation of it in *Latin* under the Title of *Elenchus Geometriæ Hobbianæ*, printed at *Oxford* in 8vo. This so provoked Mr. *Hobbes*, that he published it in *English*, with the Addition of what he called *Six Lessons to the Professors of Mathematics in Oxford*. Upon this, Dr. *Wallis* wrote an Answer in *English*, intitled, *Due Correction for Mr. Hobbes; or School-Discipline for not saying his Lesson right, &c.* *Oxford* 1656, in 8vo. Mr. *Hobbes* replied in a Book, which he called Στίγματα, or, *The Marks of the absurd Geometry, rural Language, &c. of Dr. Wallis: London*, 1657. This was immediately rejoined to by the Doctor in his *Hobbiani Puncti Dispunctio, in answer to Mr. Hobbes's Στίγματα; Oxford*, 1657. Here this Controversy seems to have ended at this Time; but four Years after, viz. in 1661, Mr. *Hobbes* printed *Examinatio & Emendatio Mathematicorum hodiernorum in sex Dialogis*; which occasioned Dr. *Wallis* to publish the next Year *Hobbius Heautontimoreūmenos; Oxford*, 1662, in 8vo, addressed to Mr. *Robert Boyle*. In 1657, the Doctor collected and published his Mathematical Works in two Parts, with the Title of *Mathesis Universalis*.

In 1658, he published, at *Oxford*, in 4to, *Commercium Epistolicum de quæstionibus Mathematicis inter J. Wallisium & alios Viros doctrinâ ac nobilitate illustres*. About this Time, Mr. *William Neile*, who had studied Mathematics at *Oxford* under the other Savilian Professor and Dr. *Wilkins*, published his Inven-

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tion of the equating of a strait Line to a crooked One, or a Parabola; and Dr. Wallis, soon after, gave the World a Demonstration of it, at large, in a Book which he published in 1659, with this Title, *De Cycloide & Corporibus inde Genitis, &c.* Upon the Restoration he met with great Respect; the King himself entertained a favourable Opinion of him, on Account of some Services which his Majesty knew the Doctor had done to his Royal Father and himself; he was therefore not only admitted one of the King's Chaplains in Ordinary, but likewise confirmed in his two Places of Savilian Professor and Keeper of the Archives at Oxford. In 1661, he was appointed one of the Divines who were empowered to review the *Book of Common Prayer*, and afterwards complied with the *Act of Uniformity*, and continued a steady Conformist to the Church of *England* till his Death. He was one of the first Members of the *Royal Society*, with which he kept a constant Correspondence, till his Death, by Letters or Papers, many of which are published in the *Philosophical Transactions*. In 1668, he published *De Æstu Maris Hypothesis Nova*, in some Letters to Mr. Boyle and Mr. Aldenbury; and in 1671, *Mechanica, sive de Motu tractatus geometricus*, in three Parts; and in 1676, *Archimedis Syracusani Arenarius & Dimensio Circuli*. In 1677, he wrote a Letter to Dr. Thomas Barlow, Bishop of *Lincoln*, concerning the *Pascal Tables* in the *Book of Common Prayer*. From 1682 to 1692 he was engaged in several theological Disputes, particularly on the Sabbath, the Unity of God, &c. on which he wrote and published sundry Tracts, and a great Variety of Letters on philosophical, mathematical, and mechanical Subjects.

In 1697, the Curators of the University Press at Oxford, thought it for the Honour of the University, to collect the Mathematical Letters, and other Works of the Doctor. He held a Correspondence with a great many learned Men, and particularly Mr. Flamsteed, as appears from several original Letters of his, which are published in the *general Dictionary*, Vol. X. p. 98, & seq. — And there are several others, to Mr. John Collins, in the Possession of the late William Jones, Esq; F. R. S. He died, October 28, 1703, being 87 Years, 3 Months, and 5 Days old, and was interred in the Choir of St. Mary's Church in Oxford, where a Monument is erected to his Memory, by his Wife,

who died at *Oxford*, *March* 17th, 1686: He had several Children, but two only survived him, *viz.* one Son and one Daughter.

Mr. *Lewis* observes, that the Doctor was happy in the Enjoyment of a vigorous Constitution of Body and Mind, which was strong, serene, and calm, and not easily ruffled, or discomposed; and that though, whilst he lived, he was looked on, by the most rigid and zealous Party-men in the University, with a jealous Eye, and suspected as not thoroughly well affected to the Monarchy and Church of *England*, he was yet very much honoured and esteemed by others of better Temper and Judgment, and of more Knowledge and Latitude of Sentiment: By these, he was always esteemed, both at Home and Abroad, as the Ornament of his Country, and of the University in particular: And this Account is very consistent with the Character which the Doctor gives of himself, above recited.

The LIFE of JOANNES BAPTISTA RICCIOLUS.

JOANNES BAPTISTA RICCIOLUS, was born at *Ferrara*, a City in *Italy*, in the Dominions of the Pope, a learned and honoured Jesuit. He was sometime a Professor of Rhetoric and Poetry, then of Philosophy and Divinity, partly at *Parma*, partly at *Bologna*; but being chiefly addicted to geographical, chronological, and mathematical Studies, his Improvements in these Sciences gave a peculiar Lustre to his Character; and he hath abundantly enobled his Memory by his many excellent Works, particularly, his *Almagestum Novum*, divided into three Tomes: in the first whereof, he treats of the Sphere, of the Sun, and Moon, and their Eclipses; of the fixed Stars, of the lesser Planets, of the Comets and new Stars, of the several mundane Systems, and six Sections of general Problems serving to Astronomy, &c. In the Second, he handles the Subject of Trigonometry, or the Doctrine of plain and spherical

The Life of JOAN. BAPT. RICCIOLUS. 279

rical Triangles; proposes to give a Treatise of astronomical Instruments, and, the optical Part of Astronomy, tho' we do not find it was ever published. In the Third, he comprehends Observations of the Sun, Moon, Eclipses of the fixed Stars and lesser Planets, with Precepts and Tables of the primary and secondary Motions, and other astronomical Tables. He put forth, likewise, another Work entitled, *Astronomia Reformata*; the Design of which is (considering the various Hypothesis of several Astronomers, and the Difficulty thence arising of concluding any Thing certain) by comparing together all the best Observations, and examining what they have most perfect in them, to reform, upon that Measure, the Principles of Astronomy. Besides which, he published his *Chronology*, in Folio: Also, a *Treatise of Geography*, of the same Size.

The above-mentioned great Work he intitles, *Almagestum Novum*, in reference to the old *Almagest of Ptolomy*, and they had both the same Design; for as that of *Ptolomy* was a Collection of the Improvements, and Inventions in Astronomy, from the earliest Ages of Antiquity to his own Time, so the same Thing was attempted by *Ricciolus*, and, in a great Measure, executed in the first Tome of his *Almagest*, which consists of two large Volumes in Folio, were published in the Year 1651, and dedicated to *Cardinal Grimaldus*. And tho' this great Man stood first in the Class of Astronomers of the last Age, yet our biographical Histories give us but a superficial Account of him, or his Writings, and mention nothing of his Age, or Time of his Death.

The LIFE of Mr. JOHN BAYER.

JOANNES BAYERUS (or *John Bayer*) was a German by Nation; but of the particular Place or Time of his Birth, History hath not informed us: However, his Name will be ever memorable in the Annals of Astronomy, on Account of that great and excellent Work which he published in the Year 1603, under the Title of URANOMETRIA, being a compleat Cele-

Celestial Atlas, or large Folio Charts of all the Constellations, with a Nomenclature collected from all the antient and modern Tables of Astronomy, with the useful Invention of denominating the Stars in every Constellation by the Letters of the *Greek Alphabet*, by which the Stars of the Heavens may, with as great Facility, be distinguished and referred to, as the several Places of the Earth are by Means of geographical Tables; and as a sufficient Proof of the Usefulness of this Method, our Celestial Atlases and Globes have ever since retained it, and is, by that Means, become of general Use through all the literary World. He was, by Profession, a Lawyer, and lived many Years after the first Publication of this Work, which he greatly improved and augmented by his constant Attention to the Study of the Stars: At length, in the Year 1627, it was re-published under a new Title, *viz. Cælum Stellatum Christianum*, that is, *the Christian stellated Heaven*; or, *the starry Heavens christianized*: For in this Work, the Heathen Names and Characters, or Figures of all the Constellations were rejected, and others, which were taken from the Scriptures, were inserted in their Stead, to circumscribe the respective Constellations. This was the Project of one *Julius Schillerus*, a Civilian of the same Place: But this Attempt was too great an Innovation, to find Success, or a general Reception; for Astronomers, having been long inured to heathen Appellations, thought it would occasion too much Trouble, to change them for others that were entirely new, especially as there was no real Religion concerned in the Nomenclature, or Denomination of the Stars.

The LIFE of WILLERBRORDUS SNELLIUS.

WILLERBRORDUS SNELLIUS, Son of *Rodolphus Snellius*, born at *Royen*, was a famous Mathematician, and was the third Person who undertook the arduous Task of measuring a Degree on the Earth's Surface; which he effected by measuring a Space between *Almaer* and *Bergen-op-zoom*, which two Places had the Difference of Latitude $1^{\circ} 11' 30''$.
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The Life of JOHN BAINBRIDGE. 281

He also measured another Distance between the Parallels of *Alemaer* and *Leyden*, and from the Mean of both these Measurements he made a Degree to consist of 55,021 *French* Toises, or Fathoms. These Measures were afterward repeated, and corrected, with great Skill and indefatigable Industry, by Mr. *Muschenbroeck*, the present learned Professor of experimental Philosophy in the University of *Leyden*; who found a Degree to consist of 57033 Toises, which was very near the same Quantity as had been determined by Mr. *Pichard*, and Mr. *Cassini*, who both of them made a Degree to consist of 57060 Toises, which was 378 more than the *French* Mathematician found it, under the arctic Circle, and 293 greater than the Degree measured under the Equator, by the *Spanish* Mathematicians in the Year 1735. As our Author stands foremost in the Number of those who have undertaken to determine the true Figure of the Earth, by Mensuration, it will perpetuate his Memory to all Posterity. Besides the Treatise in which he gives an Account of this Work, entitled *Eratostones Batavus*, he wrote many others equally fraught with Learning, viz. one concerning the Comet which appeared in 1618; another on the Elements of Trigonometry; also another Treatise entitled, *Hessian and Bohemian Observations*, with his own Notes; another Work entitled, *Libra Astronomica & Philosophica*, wherein he undertakes the Examination of the Principles of *Galileo* concerning Comets. He flourished about the Beginning of the 17th Century, as we find no Publication of his Works after the Year 1619.

The LIFE of JOHN BAINBRIDGE.

JOHN BAINBRIDGE, an eminent Physician and Astronomer, was born of a good Family at *Ashby-de-la-Zouch* in *Leicestershire*, in the Year 1582, and educated in the public School of that Town; from whence he was transplanted to *Emanuel* College in *Cambridge*, and put under the Care of Dr. *Joseph Hall*, afterwards Bishop of *Norwich*, to whom he was related. He took the Degrees in Arts, and studied Physic there; after which, he retired into his own Country, where he taught

a Grammar-school, and practised Physic with great Success; at the same Time assiduously applied himself, at all Hours of Leisure, to the Study of the Mathematics, and particularly of Astronomy, which he had been extremely fond of from his early Years. About the Year 1608, by the Advice of his Friends, (who thought that his distinguished Merit was too much concealed in the Country) he removed to *London*, in order that he might the more improve himself by Conversation, and the Advantage of Books, and was admitted a Fellow of the College of Physicians. His Description of the Comet which appeared in 1618, raised him a very great Character, and introduced him to the Acquaintance of Sir *Henry Savile*, who having founded two Lectures, one for Geometry, and the other for Astronomy, in the University of *Oxford*, in *August* 1619, preferred Mr. *Bainbridge* to the Professorship of the latter, without any Solicitation; upon which he removed to *Oxford* in 1620, and was entered a Master-commoner of *Merton* College. He was likewise incorporated Doctor of Physic, as he had stood at *Cambridge*, and resided for some Years in that College, sometime Junior, and then made Senior Reader of *Linacre's* Lecture. In this calm Retirement, which he enjoyed for the Pursuit of his Studies, he resolved upon publishing correct Editions of the antient *Greek* Astronomers, as well those which had not yet been printed, as those which had already seen the Light; and in order to qualify himself for a Work of this Nature, particularly of the Lives and Writings of the *Arabic* Astronomers, he began the Study of the *Arabic* Language when he was about 40 Years of Age, and he continued to make many considerable Improvements, and wrote on a Variety of Subjects for the Instruction and Entertainment of Posterity till the Close of his Life. He died *November* 3, 1643, at his House opposite *Merton* College, in the 62d Year of his Age, and his Body was conveyed to the public School, where an Oration having been pronounced in Honour of him by Mr. *William Strode*, the University Orator, it was carried to *Merton* College Church, and deposited on the left Side of Mr. *Henry Briggs's* Grave, and an Epitaph was inscribed upon his Monument in *Latin*; in *English*, to the following Purport, “ If you desire, Passenger, to know who, and how great a Man lies here, you must enquire elsewhere; I cannot

not sufficiently inform you ; but, that you may not be ignorant of the most remarkable Circumstances relating to him, read the following Account of him : JOHN BAINBRIDGE, a Man of the clearest Character, and incomparable Learning, Professor of Physic and Mathematics ; as successful in the Cure of Diseases, as sagacious in the Observations of the Stars ; who was appointed by that excellent Judge of Men and Books, Sir *Henry Savile*, his first Professor of Astronomy, and his worthy Colleague in those Lectures of Mathematics, which he had founded in a magnificent Manner ; who being educated at *Cambridge*, was entertained by the University of *Oxford* as her own Son, and honoured by her with a public Funeral, as an equal Ornament to both the Universities ; and died, too early for the Interests of Learning, in 1643. Go now, Passenger, and learn, even from Foreigners, what else relate to his Character.” Dr. *Smith* tells us, that as his unaffected Piety and Humanity procured him an universal Esteem among his Contemporaries, so his great Skill in the Mathematics, and polite Learning, exemplified in his Writings, will render his Character peculiarly honoured and esteemed by Posterity. Some of the principal Books he wrote were,

I. An astronomical Description of the late Comet, from the 18th of *November*, 1618, to the 16th of *December* following. Printed at *London*, 1619.

II. A *Latin* Version of *Proclus's* Sphere. *London*, printed in 1620.

III. A Treatise of the Canicular Year, or the natural Year of the *Egyptians* ; which began with the heliacal Rising of the Dog-star, and of the canicular Days, and the rising of that Star and the sothiacal Period. Published at *Oxford* in 1648. Dr. *Bainbridge* wrote this Treatise at the Request of Archbishop *Usher*, but left it imperfect, being prevented either by the breaking out of the Civil War, or by Death ; so that he was not able to finish his Demonstration of the heliacal Rising of the Dog-star. But Dr. *Greaves* published that Treatise of our Author's with some Additions and Improvements ; since which Time we have had none of our Author's Writings published, though many of his Dissertations were prepared for, and committed to the Press, soon after his Decease, viz. A Dissertation concerning the Method of finding out the Differences of the Meridians, or Longitudes.

tudes. — Another, concerning the Star of *Venus*. But those Pieces are very inconsiderable in Comparison of those Manuscripts he bequeathed to Archbishop *Usher*, and which are now preserved in the Library at *Trinity College, Dublin*: Amongst others, mentioned by Dr. *Smith*, is a Theory of the Sun; a Theory of the Moon; a Discourse concerning the Quantity of the Year; two Volumes of astronomical Observations; and 9 or 10 Volumes of miscellaneous Papers, relating to the Mathematics: And that Gentleman observes, it would probably be of great Service to the Public, if any of the Mathematicians in *Ireland*, who have the Opportunity of examining those Manuscripts, would communicate to the learned World what they find of Importance to Astronomy: For though every intelligent Person must confess, that a great many notable Discoveries, unknown to him, have been made since his Time, in Astronomy, by *Gassendus*, *Hevelius*, *Ricciolus*, *Bulialdus*, *Cassini*, and our Countrymen, Dr. *Ward*, *Hook*, *Flamsteed*, Dr. *Halley*, and, above all, Sir *Isaac Newton*; yet it is not only a Pleasure, but even an Advantage, to learn, from the Writings of the former Astronomers, what Observations they have made, and by what Steps and Methods that Science has been brought to Perfection; since their imperfect Notices, Conjectures and Hints, may give Occasion for the Discovery of many Things which might otherwise never have been thought of.

The LIFE of SETH WARD.

SETH WARD, Bishop of *Salisbury*, Son of Mr. *John Ward* an Attorney, was born at *Buntingford* in *Hertfordshire*, and baptized there, *April 15, 1617*. He was educated in Grammar Learning, at a School in the same Place, and thence removed to *Sidney College* in *Cambridge*, into which he was admitted in 1632, and applied himself, with great Assiduity, to his Studies, especially to the Mathematics: He soon became a considerable Proficient, and took the Degrees of Bachelor and Master of Arts, and was made Fellow of the College. In 1640,

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He was appointed Prævaricator of the University; and when his Patron, Dr. *Samuel Ward*, Master of the College, was imprisoned, he attended him during his Confinement. He was ejected out of his Fellowship, for refusing the Covenant; against which he soon after joined with Mr. *Peter Gunning*, Mr. *Isaac Barrow*, afterwards Bishop of *St. Asaph*, and Mr. *John Barwick*, and in drawing up their noted Remonstrance against it. — Being now obliged to leave *Cambridge*, he resided for sometime with his Relations in and about *London*, and, at other Times, with the celebrated Mathematician Mr. *William Oughtred* at *Aldbury* in *Surry*, under whom he prosecuted his mathematical Studies: And also visited Lord *Wenman* of *Tame Park* in *Bedfordshire*. About this Time, Mr. *John Greaves*, Savilian Professor of Astronomy at *Oxford*, endeavoured to procure him for his Successor in that Professorship, from which himself had been ejected, which was accordingly done, and Mr. *Ward* discharged the Duties of that Place with great Applause, having about that Time entered himself of *Wadham College*, for the Sake of Dr. *Wilkins*, Warden of the College, and, *October 23*, the same Year, was incorporated Master of Arts at *Oxford*. In 1649, he was collated by Dr. *Brownrigg*, Bishop of *Exeter*, to the Præcentorship of the Church of *Exeter*. *May 1654*, he took the Degree of Doctor of Divinity. In 1657, he was elected Principal of *Jesus Colloge* in *Oxford*. In 1659, he was chosen President of *Trinity College* in that University, which Place he resigned upon the Restoration, and was presented to the Rectory of *St. Laurence Jewry*. In 1661, he became Fellow of the *Royal Society*, and Dean of *Exeter*; and, the Year following, was advanced to the episcopal See of that Church: And, *September 12*, 1667, was translated to the Bishoprick of *Salisbury*. In 1671, he was made Chancellor of the Garter, and procured that Honour to be annexed to the See of *Salisbury*, after it had been held by Laymen 132 Years. Some Years before his Death, he began to lose his Memory, and the Use of his Reason, in a very great Measure; under which Circumstances he died at *Knightbridge*, near *London*, *January 6th*, 1689, and was interred in the Cathedral at *Salisbury*, where his Nephew, Mr. *Seth Ward*, erected a Monument for him.

Mr. *Oughtred*, in his *Clavis Mathematica*, styles him, a prudent, pious, and ingenious Person, and well skilled, not only in Mathematics, but likewise in all Kinds of Literature: But that by which he hath signalized his Name in all the learned World is, his celebrated Invention of an Approximation to the true Place of a Comet, from a given mean Anomaly founded upon an Hypothesis, that the Motion of a Planet, though it be really performed in an ecliptic Orbit, may yet be looked upon as even, or equable, about the upper Focus of the Ellipsis, or that next the *Aphelion*: By this Means he rendered the Praxis of Calculation much easier than any that could be used in resolving what has been commonly called *Kepler's* Problem, where the coequate Anomaly was to be immediately investigated from the mean Elliptic one, and this agrees very well with those Orbits which are elliptical in a very small Degree, as that of the *Earth* and *Venus*: But in others, that were more elliptical, as that of *Mercury*, *Mars*, &c. this Approximation stood in Need of a considerable Correction, which was made by *Bulialdus*, as we shall relate in his Life, which is next to follow. The principal of his Writings are as follow:

I. A philosophical Essay, evincing the Being and Attributes of God.

II. His Prelection concerning Comets, wherein the Nature of Comets is discoursed of, a new Theory of them proposed, and the History of a late Comet which appeared in the Year 1652.

III. A brief Enquiry into the Grounds and Principles of *Bulialdus's* philolaic Astronomy; wherein *Bulialdus's* Error is detected, and the Method of calculating the double Inequality of the Planet's Motion is geometrically evinced.

IV. An Idea of Trigonometry, for the Use of the Students in the University of *Oxford*.

V. His geometrical Astronomy; in which a Method is proposed for solving, geometrically, all the Phænomena of the primary Planets, whether they are considered in the elliptic or circular Hypothesis.

VI. An epistolary Exercitation on the Philosophy of *Hobbes*, with an Appendix, containing an Answer to many Objections and

and Calumnies from that Author : Besides these, he published many other Pieces in Divinity, which do not immedi ally fall under our Consideration.

The LIFE of ISMAEL BULIALDUS.

ISMAEL BULIALDUS, Son of *Ismael Bulialdus*, and Native of *Loudun*, a Town in the Province of *Poitou* in *France*, gave very early Proofs of his astronomical Genius, and future Time rendered him beloved and admired : *Ricciolus* stiled him, *Astronomus profundæ indaginis*. This Character he hath justly merited, as well by his Publication of the most valuable Works of antient Astronomers and Mathematicians, with Notes, &c. as by his other most learned Labours. He first published his Dissertation entitled, *Philolaus, sive de vero systemate mundi* : Or, his true System of the World, according to *Philolaus*, an antient Philosopher and Astronomer. Afterwards, in the Year 1645, he set forth his *Astronomia Philolaica*, or his *Philolaic Astronomy*, grounded upon the Hypothesis of the Earth's Motion, and the elliptical Orbit described by the Planet's Motion about a Cone ; illustrated with various Methods of Demonstration. To which he added *Tables* entitled, *Tabulæ Philolaicæ*, in which the Motions of *Saturn*, *Jupiter*, and *Mercury*, are more accurately represented than in the *Rudolphine Tables*, being, for the most Part, much easier than those : A Work, says *Ricciolus*, that ought to be read by all Students of Astronomy, but not without Attention. He considered the Hypothesis, or rather Approximation of Bishop *Ward*, and found it not to agree with the Planet *Mars* ; for he hath shewn, in his Defence of the *Philolaic Astronomy* against the Bishop, that from four Observations made by *Tycho* on the Planet *Mars*, that Planet was in the first and third Quarters of the mean Anomaly, was more forward than he ought to be, according to *Ward's* Hypothesis ; but in the second and fourth Quadrant of the same it is not so far advanced as that Hypothesis required : He therefore set about a Correction of the Bishop's Hypothesis, and made it to answer
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more exactly to the Orbits of the Planets, which were most ex-centric, and introduced what is called, by *Street* in his *Caroline Tables*, the Variation; for those Tables were calculated from this Correction of *Bulialdus*, and exceeded all, in Exactness, that went before.

It is remarkable, that the Ellipsis, which he has chose for a Planet's Motion, is such a one, which, if cut out of a Cone, will have the Axis of the Cone passing thro' one of its *Foci*, viz. that next the Aphelion.

This Correction of *Bulialdus* is, in the Judgment of Dr. *Gregory*, a very happy one, if it be not set above its due Place; and he accounted no more than a Correction of an Approximation to the true System: For so much it hath effected, that we at Length are able to gather the coequate Anomaly, *a Priori*, and directly from the Mean, and that the Observations are well enough answered at the same Time; which Thing, in *Mercator's* Opinion, no Man hath done before in the elliptic Hypothesis: For which Reason, this Correction is very justly applied to astronomical Calculation.

He also wrote a learned Treatise concerning the Nature of spiral Lines; as also, two Admonitions to Astronomers. The 1st, concerning a new Star in the Neck of the Whale, appearing at some Times, and disappearing at others. The 2d, concerning a nebulous Star in the Northern Part of *Andromeda's* Girdle, not discovered to any of the Antients. This cloudy Star did also sometimes appear, and sometimes not. These Phænomena appearing, new and very surprizing, he strongly recommends to all who are curious in Astronomy.

We have no Account in biographical Authors of the Life of this great Man, nor the Time of his Decease.

The LIFE of JOHN WILKINS.

JOHN WILKINS, Bishop of *Chester*, was the Son of Mr. *Walter Wilkins* a Citizen of *Oxford*, born at *Fawlfey*, near *Daventry* in *Northamptonshire*, in the House of his Mother's Father, the celebrated Mr. *Dod*. He was educated in Grammar Learning under Mr. *Edward Sylvester*, a Man eminent for his Skill in the *Greek* Language, who taught a private School in *All-Saints* Parish in *Oxford*, and was entered a Student in *New-Inn*, in that University, in *Easter* Term, 1627, when but 13 Years of Age; but, making no long Stay, he was removed to *Magdalen Hall*, under the Tuition of Mr. *John Tombes*. October 20, 1631, he took the Degree of Batchelor of Arts; and June 11, 1634, that of Master. Having entered into holy Orders, he became Chaplain to *William*, Lord *Say*, and afterwards to *Charles*, Count *Palatine* of the *Rhine*, with whom he continued for some Time. In 1638, he published his Discovery of a new World; or an Attempt to prove, that there may be another habitable World in the Moon. In 1640, he published his Discourse concerning a new Planet, tending to prove that it is probable, our Earth is one of the Planets. This Discourse contains the ten following Propositions, viz: I. That the seeming Novelty and Singularity of this Opinion can be no sufficient Reason to prove it erroneous. II. That the Places of Scripture which seem to intimate the diurnal Motion of the Sun, or Heavens, are fairly capable of another Interpretation. III. That the Holy Ghost, in many Places of Scripture, does plainly conform his Expressions to the Error of our Conceptions, and does not speak of sundry Things as they are in themselves, but as they appear unto us. IV. That diverse learned Men have fallen into great Absurdities, while they have looked for the Grounds of Philosophy from the Grounds of Scripture. V. That the Words of Scripture, in their proper and strict Construction, do not any where affirm the Immobility of the Earth. VI. That there is not any Argument from Scripture, Principles of Nature, or Observations in Astronomy, which can sufficiently evidence the Earth to be in the Center of the Universe. VII. It is probable that the Sun is the Center of the World. VIII.

That there is not any sufficient Reason to prove the Earth incapable of those Motions, which *Copernicus* ascribes unto it. IX. That it is much more probable, that the Earth does move, than the Heavens. X. That this Hypothesis is exactly agreeable to common Appearances. In 1648, he likewise published a Book entitled, *Mathematical Magic*; or, *the Wonders that may be performed by mathematical Geometry*. In two Volumes, reprinted in 1680. Besides these of an astronomical and mathematical Nature, he published an Essay towards a real and philosophical Language, in 1668; of which, some Account is given in the *Philosophical Transactions*, N^o. 35. He also published sundry Tracts in Theology, natural Religion, and civil Polity; which, for their Piety and Moderation, went thro' several Editions. — About the Year 1656, he married *Robina*, Widow of *Peter French*, sometime Canon of *Christ-Church*; and Sister to *Oliver Cromwell* Protector of *England*, which Marriage being contrary to the Statutes of *Wadham College*, because they prohibit the Warden thereof from marrying, he obtained a Dispensation from *Oliver* to retain the Wardenship: Notwithstanding he was likewise made Master of *Trinity College, Cambridge*, but ejected the Year following, upon the Restoration. He was then chosen Preacher to the honourable Society of *Gray's-Inn* in *London*, and presented to the Rectory of *St. Laurence Jewry*, upon the Promotion of *Dr. Seth Ward* to the Bishoprick of *Exeter*, and afterwards made Dean of *Rippon*, and, in 1668, Bishop of *Chester*. He died at *Dr. John Tillotson's* in *Chancery-lane, London*, Nov. 19, 1672, and was buried the 12th of *December* following, in the Church of *St. Laurence Jewry*, *Dr. William Lloyd*, then Dean of *Bangor*, preached his funeral Sermon, wherein it was observed of him, that he was an excellent Mathematician, and skilful in experimental Philosophy, and that both by his intellectual and moral Endowments he was an Ornament to the University, and an Honour to the *British Nation*.

The LIFE of JOHN HEVELIUS.

JOHN HEVELIUS, Consul of *Dantzick*, was born in *Holland* in the Year 1612; joined to a remarkable Genius an indefatigable Assiduity in the Study of the Stars, from whence he acquired very great Proficiency in the astronomical Science, and from many new and masterly Inventions, and Experiments, was able to communicate to Posterity, many curious Observations, and demonstrate the same with great Satisfaction to those who were Students in this Part of Literature, and enobled his Name to Posterity by many valuable Works, some of the Principal of which were his *Selenographia*, or an exact Description of the Moon, wherein he engraved all its Phases, distinguished by Names, all its Parts, and ascertained their respective Bounds by the Help of Telescopes; containing, likewise, a Delineation of the several Spots therein visible, and of the various Motions, Changes, and Appearances, discovered by the Telescope, as well in that as in the Sun and other Planets. — His *Cometographia*, representing the whole Nature of Comets, their Situation, Parallaxes, Distances, diverse Appearances, and surprising Motions, with a History of all the Comets from the Beginning of the World down to the present Time, either noted by Historians, or observed by Philosophers, or Astronomers; both the said Works being enriched with curious Sculpture of his own finishing; to these he likewise added a Treatise of *Mercury*, discovered in the Sun at *Dantzick*, May 3, N. S. 1661, with the History of a new Star, appearing in the Neck of *Cetus*, and another in the Beak of *Cygnus*; his Illustration of some Astronomical Discoveries of the late Mr. *Horrox* in his Treatise upon *Venus*, seen in the Sun on the 24th of November, O. S. 1639, being the noblest, and, since the Beginning of the World, 'till then unpractised, Observation, with a Discourse of some rare Paraselenæ and Parhelia, by him discovered at *Dantzick*. — Likewise, his two Epistles to *Ricciolus*, concerning the Moon's Vibration, with Copper-plate Prints; together with other Astronomical Pieces which are mentioned in the *Philosophical Transactions*, 1673. He put forth, the same Year, his *Machina Cœlestis*, consisting of Four Parts, viz. I. His *Pro-*
domus

domus to Astronomy, with an entire Catalogue of the fixed Stars; and a new Celestial Globe reformed. II. Containing all his celestial Observations, as well of Eclipses as of the Occultations of the Planets and fixed Stars from the Year 1630 to the then present Time. III. Shewing his Observations of the Meridian Altitudes of the Sun, and of the Equinoxes and Solstices, from the Year 1632 to that Time; as, likewise, special Observations of every Planet. The IVth and last, exhibits a Catalogue or Index of the Distances of the fixed Stars, taken by his large brass Sextants and Octants, together with those noted by the Landgrave of *Hesse*, *Tycho*, *Gassendus*, and *Ricciolus*, &c. besides a great Number of Epistles; for he continued his Studies and Publications on Astronomical Sciences for 50 Years; during which Time he held a Correspondence with the Learned in that Profession throughout *Europe*; on all which Accounts his Name will be transmitted to Posterity, with the greatest Honour. After a long, and valuable Life, he died in 1688, aged 76 Years.

The LIFE of LE PERE CHERUBIN.

LE PERE CHERUBIN justly merits a Place in a Work of this Nature, tho' he has been often omitted or very slightly mentioned by Biographers in general, so that we are not certain precisely of the Time, or Place of his Birth, but that he flourished about the Year 1650; that after he had acquired a proper Knowledge in the Languages, he was admitted a Capuchin Friar in the Convent of that Order in *Orleans*, where his Genius for astronomical Subjects soon became very conspicuous, which were greatly improved by close Application, and gave many considerable Proofs of his Attainments in this Study by many useful Works; the most considerable of which was a large and elegant Volume in *French*, entitled *Dioptrique Oculaire*, or *Ocular Dioptrics*, concerning the Theory, Use, and Mechanism of Telescopes, divided into three Parts; the First containing the Doctrine of Optics and Dioptrics, or of simple Vision direct,

The Life of WILLIAM OUGHTRED. 293

direct, and that which is made by Rays refracted. — The Second treats of the Theory of Telescopes, in all its Kinds; which is introduced by a general History of the Invention and Antiquity of Telescopes, and by a Discourse concerning the Difference of the antient Glasses from the Modern. — The third and last Part is, moreover, divided into two distinct Parts, *viz.* the Positive, and Mechanical: The Positive, teaching the actual Construction of Telescopes, and their Uses in the Observation of celestial Objects: The Mechanical, shewing the Way of polishing and forming all Sorts of Glasses that serve for Telescopes; giving, likewise, an Account of several Discoveries that, by their Means, had been made by modern Astronomers. This Work is adorned with most curious and elegant Sculptures of Instruments of the Author's own designing, and was printed with an answerable Letter, in Folio, at *Paris*, 1671. By this Account, it appears about what Time he flourished; but our Historians and Biographers do not inform us of the Time or Place of his Death.

The LIFE of WILLIAM OUGHTRED.

WILLIAM OUGHTRED was an eminent *English* Mathematician, in the 17th Century, was born at *Eaton* in the Year 1573, as appears from a Picture of his, by *Haller*, where he is said to be *Anno Ætatis* 73, 1646, and educated in the School there; whence he was elected to *King's College, Cambridge*, in 1592, and where he took the Degree of Bachelor of Arts in 1596, and Master in 1599. He was Fellow of that College, and, in that Society, continued about twelve Years; all the Time which could be spared there, from his academical Studies, he employed upon mathematical Sciences; and by inciting, assisting, and instructing others, he brought many to relish that noble and useful Part of Learning. In 1673, he took holy Orders, and was presented to the Rectory of *Aldbury*, near *Guildford* in *Surry*, where he lived a retired and studious Life, seldom travelling so far as *London* once in a Year; his

Recreation being a Diversity of Studies: “As oft (says he) as I was tired with the Labours of my own Profession, I have allayed that Tediousness by walking in the pleasant, and more than *Elysian Fields* of the diverse and various Parts of human Learning, and not of the Mathematics only.” About the Year 1628, he was appointed, by the Earl of *Arundel*, Tutor to his Son *William* in the Mathematics. Besides his close Application to Study, he kept a Correspondence, by Letters, with some of the most eminent Scholars of his Time upon mathematical Subjects: The Originals of which were preserved, and communicated to the *Royal Society*, by *William Jones*, F. R. S. and Mr. *Lloyd* tells us, that the choicest Mathematicians of his Time owed much of their Skill to him, whose House was full of young Gentlemen that came from all Parts, to be instructed by him. He was much requested to have lived in *Italy*, *France*, and *Holland*, when he was little observed in *England*, being generally esteemed an Adept in the Languages, solid in Arithmetic, Astronomy, and the Sphere, of all Measures, Music, &c. exact in his Stile as in his Judgment, handling his mathematical Instruments with as great Accuracy at 80, as others would at 30, owing, as he said, to Temperance and Exercise; principling his Friends and Acquaintance with plain and solid Truths, as he did the World with great and useful Arts, and advancing new Inventions in every Thing but Religion, which he endeavoured to promote in its primitive Purity, maintaining, that Prudence, Meekness, and Simplicity were the great Ornaments of his Life. Most of his Books were published with *Latin* Titles; but the Principal of all was that which he published in 1631, under the Title of *Arithmeticae in Numero & Speciebus Institutio*. This Treatise he proposed should serve as a general Key to the Mathematics: It was afterwards reprinted, with considerable Alterations and Additions, in the Year 1648, under the real Title of *A Key to the Mathematics*. It was also published in *English*, with an additional Tract of the Resolution of all Kinds of affected Equations in Numbers. Also another, on Compound Interest. A Third, on the easy Art of delineating all Manner of plain Sun-dials: Also, a Demonstration of the Rule of false Position. A third Edition of the same Work was printed in 1652, in *Latin*, 8vo. with the before-mentioned

The Life of JOHN GREAVES. 295

Tracts, and the Addition of some others, *viz.* One on the Use of Logarithms, a Declaration of the 10th Book of *Euclid's Elements*, ——— a Treatise of regular Solids, ——— another of the Theorems contained in the Books of *Archimedes*. ——— Another considerable Work of his was, a Treatise on *Circles of Proportion*, and a *horizontal Instrument*; published, in the Year 1633, in 4to. by his Scholar Mr. *William Foster*. In the Year 1636, was printed, in *London*, his Description and Use of the double horizontal Dial, in 8vo. In 1657 was published, his Treatise of Trigonometry, in *Latin*; and another in *English*: Together with Tables of Sines, Tangents, and Secants, with several other posthumous Pieces.

Our Author, tho' undoubtedly a very great Mathematician, yet was far from having the happiest Method of treating the several Subjects on which he wrote. His Stile was very concise, obscure, and dry, and his Rules and Precepts so involved in Symbols and Abbreviations, as rendered his mathematical Writings very difficult to be understood.

The LIFE of JOHN GREAVES.

MR. *John Greaves*, a learned *English* Writer, in the 17th Century, born in 1602, was the eldest Son of Mr. *Geo. Greaves*, Rector of *Colmore* near *Alresford*, who was Master of an eminent Grammar-school; his Son, in Consequence thereof, was well instructed in the fundamental Rules of Literature, and was sent to the University of *Oxford* in 1617. July 6, 1621, he took the Degree of Bachelor of Arts, and in 1624 became a Candidate for *Morton College*, and, on Account of his uncommon Skill in Philosophy and polite Literature, was the First of the Five who were elected: June 25, 1628, he took the Degree of Master of Arts. Having now read over all the *Greek* and *Latin* Writers with great Attention, he applied himself to the Study of natural Philosophy and the Mathematics; and having contracted an intimate Friendship with Mr. *Henry Briggs*, *Savillian* Professor of Geometry in the University of *Oxford*,
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and Dr. *John Bainbridge*, *Savillian* Professor of Astronomy there, he was animated, by their Example, to prosecute the Study of the Mathematics with indefatigable Industry; and not content with having read over the Writings of *Copernicus*, *Regiomontanus*, *Purbach*, *Tycho Brahe*, *Kepler*, and other celebrated Astronomers of that and the preceding Age, he made the ancient *Greek*, *Arabian*, and *Persian* Authors familiar to him, having before gained an accurate Skill in the *Oriental* Languages. His Reputation began now to be so considerable, that, upon several Testimonials of his great Abilities, he was chosen Professor of Geometry in *Gresham College* at *London*, upon the Resignation of *Mr. Peter Turner*, and, at the same Time, held his Fellowship of *Morton College*. — About this Time, he formed a Resolution of travelling into foreign Countries; and it appears, that, in the Year 1635, he went to *Paris* and to *Leyden*, where he became acquainted with the celebrated *James Golius*; but he had a further Design of visiting the *Eastern* Countries, and accordingly went for *Leghorn* in 1637, from whence he proceeded to *Rome*, where he accurately surveyed the venerable Remains of Antiquity: Here he, likewise, corresponded with the Keeper of the *Vatican* Library, *Athanasius Kircher*, and *Gasper Bertius*, a celebrated Astronomer, who informed him, that they had found by repeated Observations with a large Instrument of *Clavius*, that the Altitude of the Pole of *Rome* was $41^{\circ} 46'$. From *Rome* he went to *Padua*, where he was introduced to the Acquaintance of the Professors there: From hence he went to *Florence*, where he staid a few Weeks, and afterwards returned to *Leghorn*, where he embarked for *Constantinople*, and arrived there in 1638: In *September* following he embarked for *Egypt*; but, being obliged to put into *Rhodes*, he went ashore, and taking with him a brass Astrolabe of *Gemma Frisius*, he found the Elevation of the Pole there to be $37^{\circ} 50'$. At length he arrived at *Alexandria*, where he staid four or five Months, and made a great Number of useful Observations, several of which are noted down in a MSS. of his in the *Savillian* Library at *Oxford*, which was bought, with other MSS. of his, of the Widow of Dr. *Nich. Greaves*, our Author's Brother, by Mr. *Richard Stubbs*; and Dr. *Thomas Smith* sent an Abstract of that MSS. to the *Royal Society* in 1683. — From *Alexandria*, Mr.

Greaves went to *Grand Cairo* to measure the Pyramids, carrying with him a Radius of 10 Feet, most accurately divided into 10,000 Parts; while there, he adjusted the Measure of the Foot, observed by all Nations, in one of the Rooms under the said Pyramid, with his Name, *John Gravius*, under it. About 1639, he returned to *Leghorn*, from whence he proceeded to *Florence*, where he was received with great Civility by *Ferdinand II.* Grand Duke of *Tuscany*, to whom he inscribed a *Latin Poem*. From *Florence*, Mr. *Greaves* went to *Rome*, to repeat his Observations which he had made there before, and to make new Ones; but his Stay there was short, as he had, by this Time, a Desire of returning to his native Country, where he arrived in the Summer of the Year 1640. — November 14, 1643, upon the Decease of Dr. *John Bainbridge*, he was chosen *Savilian* Professor of Astronomy at *Oxford*, and principal Reader of *Linacre's* Lecture in *Merton College*. — In 1645, he proposed a Method for reforming the Calendar, by omitting the Intercalary-day for 40 Years to come. This Paper was published, by Dr. *Thomas Smith*, in the *Philosophical Transactions*, October 1699. — In 1646, he published, at *London*, in October, his *Pyramidographia*, or, a Description of the Pyramids of *Egypt*; and, in 1647, his Discourse of the *Roman Foot* and *Denarius*; from whence, as from two Principles, the Measures and Weights used by the Antients may be deduced: This he dedicated to his truly noble and learned Friend, *John Selden*. Soon after this, he was ejected, by the Parliament Visitors, from the Professorship of Astronomy, and Fellowship of *Merton College*; and the Soldiers committed many Outrages, broke open his Chest, and destroyed many of his Manuscripts, which greatly affected him. He then retired to *London*, where, after some Time, he married, and prosecuted his Studies with great Vigour, as appears from sundry of his philosophical and theological Works. But this was but a transient Happiness to him; for he died at *London*, October 8, 1652, not full 50 Years of Age, leaving his astronomical Instruments to the *Savilian Library* in the University of *Oxford*, where they are repositied.

The LIFE of MARIA CUNITIA.

MARIA CUNITIA, descended from an antient and honourable Family in *Silesia*; her Father's Name was *Henricus Cunitius*; she discovered, in her early Years, a remarkable Genius for the most noble and sublime Studies, which were cultivated and encouraged by her Father, by affording her every proper Assistance in some Measure suitable to her distinguishing Talents, and the high Expectations he had formed from thence. Her first Attempts were chiefly to acquire a Knowledge in the oriental Languages, in which she became so great a Proficient as to merit the Character of one eminently skilful in the Languages, and of such History as greatly depended on that Kind of Knowledge; but is by no Means looked upon as her greatest Attainments; for, like another *Hypatia*, she excelled in many Branches of mathematical Learning, and was an Adept in Astronomy, to which she applied herself with great Assiduity, in the Study of the most valuable Writings on these Sciences, in which her singular Penetration, and consequent Improvement, soon became very conspicuous by several ingenious and useful Works: One entitled, *Urania Propitia*: Wherein she hath set forth astronomical Tables of wonderful Facility and Exactness, founded upon *Kepler's* Hypothesis, investigating and explaining the celestial Phænomena by a most easy and compendious Way of Calculation, expressing and performing, by explicit Numbers, what the *Rudolphine* Tables contain implicitly in Logarithmical Numbers, and thence require to be effected. This Book was dedicated, by her and her Husband (*Elias à Leonibus*) to *Ferdinand* the Third, Emperor of *Germany*, and printed in Folio, by *Joannes Seyffertus*, 1650, in *Latin* and *High Dutch*. But, notwithstanding her Merit shines with such peculiar Lustre as to reflect Dignity on her Sex, History does not inform us of the Time, or Place of her Death, nor of any peculiar Honours paid to her Worth: No Monument we find rear'd to her Fame, and all our Biographers pass her over without the least Notice.

The LIFE of Sir JONAS MOORE.

SIR JONAS MOORE, born about the Year 1620, at *Whitby* in *Lancashire*, after enjoying the Advantages of a liberal Education, bent his Studies principally to the Mathematics, animated and encouraged thereto by a regard to the public Good; as his Talents were, in some Measure, answerable to his great Designs, so his eminent Skill in the Mathematics, which was publicly known, introduced him to the Favour and Esteem, and very considerable Employments under his Majesty King *Charles II.* which he distinguished with Honour and Dignity. Some Years before his Death, he was chosen one of the Governors of *Christ's Hospital*, where he soon found an Opportunity of exerting his Abilities in a Manner somewhat answerable to his Wishes, viz. that of serving the rising Generation: And considering with himself the Advantage and Benefit which the Nation might receive from a mathematical School, if rightly conducted, he made it his utmost Care to promote the Improvement of it. — His Majesty had, indeed, of his own Bounty, by the Mediation of his Royal Highness, been pleased to order a liberal Allowance for the Maintenance of a select Number of the ablest and fittest Youths of the said Hospital, to be annually chosen, as also for that of a Master to instruct them in such Parts of the Mathematics as are requisite in a skilful Seaman.

The School was settled; but there still wanted a methodical Institution from which the Youths might receive such necessary Helps as their Studies required: A laborious Work, from which great and assiduous Employments Sir *Jonas* might justly have exempted himself, had not a predominant Regard to a more general Usefulness engaged him to devote all the leisure Hours of his declining Years to the Improvement of so useful and so important a Seminary of Learning.

Having thus engaged himself in the Prosecution of this generous Design, the first Thing to be determined was, his Method; and this is supposed to be exhibited in his *general System of Mathematics*, divided into eight Parts, viz. Part I. Contain-

ing;

ing, Arithmetic as well natural and decimal, as in Species, or the Principles of Algebra. II. Practical Geometry, together with the first six Books of *Euclid's* Elements; as also, the 11th and 12th symbolically demonstrated. III. Trigonometry, plain and spherical. IV. Cosmography; or, a Description of the Heavens. V. Navigation, or Sailing, by a plain, or *Merca-* *tor's* Chart; as also, by the Arch of a great Circle, &c. VI. The Doctrine of the Sphere, grounded on the Motion of the Earth, according to the old *Pythagorean* and *Copernican* System. VII. Astronomical Tables, with Tables of Logarithms, natural and artificial, Sines and Tangents, and versed Sines. VIII. A new Geography, or a Description of the most eminent Countries and Coasts of the World, with Maps of them, and Tables of their Latitude and Longitude, by Sir *Jonas Moore*, Knt. late Surveyor General of his Majesty's Ordnance, and F. R. S. printed in two large 4to. Volumes, and published at London in 1681, by his Sons-in-Law, *William Hanway* and *John Pottinger*. In the Preface to this Work, the said Editors furnish us with many Particulars relative to the great Care, Labour, and Expence, in the progressive finishing the several Parts of this Work, which was in great Measure accomplished in the Life-time of Sir *Jonas*, and for that Purpose he kept a Correspondence with, and received considerable Assurances from other eminent Mathematicians, particularly Mr. *Flamsteed*, and some of the Figures for illustrating the Work borrowed from Doctor *Barrow* and others.

Sir *Jonas* was just ready to enter upon the fifth Part, which treats of Navigation, and conceived himself within View of the much desired Conclusion of this Work, when it pleased the divine Providence to put a Period to his Labours, which happened according to his own Desire, viz. that of ending his Days in his Majesty's Service, and the Promotion of mathematical Knowledge.

The Author's known Abilities had raised in the Minds of the Public (especially those who had a Taste for these Studies) great Expectations; and many Solicitations from Persons of Rank, besides those of the Governors, were used to facilitate it; but nothing considerable done till Mr. *Hanway* came over from *Ireland*, who, with the other Son-in-Law, spared no Cost nor Pains.

Pains to have the Whole executed in the best Manner, and to call in proper Assistants, where it was wanting, for the illustrating any Part of it: To whose Merit the Public are, in some Measure, indebted, that the Work was so well compleated, and that the Public have long reaped Advantage from it, these Anecdotes of so valuable a Life we have been obliged to collect from the Editor's Preface to his Works, not having been able to procure any Intelligence from the voluminous Works of biographical Writers, which is another egregious Instance how little they have attended to the Merit and Characters of the greatest Men, whose Fate in *England* has generally been to have but little Honour while living, and, when dead, to be buried in Oblivion.

The LIFE of JOHANNES DOMINICUS
CASSINI.

JOHANNES DOMINICUS CASSINI, a most excellent Astronomer, descended from a noble Family in *Piedmont* in *Italy*, born the 8th of *June*, 1625: In his early Years, he discovered an uncommon Genius and Disposition for Learning, which was improved by proper Care in his Parents and Tutors: After he had laid a proper Foundation for his Studies at Home, he was sent to continue them in a College of Jesuits. He had an uncommon Turn for *Latin* Poetry, which he exercised so very early, that some Poems of his were published when but eleven Years of Age. At Length he turned his Thoughts to the Study of Astronomy, and meeting with some Books very opportunely on that Subject, he read, and made Observations upon them; and, from the Pleasure and Satisfaction he felt in himself, his Propensity was very strong to prosecute that Study, and in a short Time made so amazing a Progress, that, in the Year 1650, the Senate of *Bologne* invited him to be their public mathematical Professor. He was not more than 15 Years of Age when he first went to *Bologne*, where he taught Mathematics, and made Observations upon the Heavens with great Assiduity

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duity and Diligence. — In the Year 1652, a Comet appeared at *Bologne*, which he observed with great Accuracy, and discovered, that Comets were not Bodies accidentally generated in the heavenly Regions, as had usually been supposed, but of the same Nature, and, probably, governed by the same Laws as the Planets. — The same Year he solved an astronomical Problem, which *Kepler* and *Bullialdus* had given up as insolvable: It was, to determine, geometrically, the Apogee and Excentricity of a Planet from its true and mean Place. — In the Year 1653, when the Church of *Bologne* was repaired and enlarged, he obtained Leave of the Senate to correct, and settle a Meridian Line. This Gnomon *Cassini* made by placing the Brass Plate, through the Hole of which the Rays of the Sun were to pass, in the Roof of the Church, and drew a Meridian Line 120 Feet in Length upon the Pavement; which was admirably well represented in the Reverse of a Medal struck upon that Occasion, which is represented by a curious Print thereof prefixed to the first Book of *Long's Astronomy*, and a larger Picture thereof may be seen in *Wright's Travels*. These are said to be some of his Performances in his younger Years.

In the Year 1657, he attended, as an Assistant, a Nobleman who was sent to *Rome* to compare some Differences which had arisen between *Bologne* and *Ferrara*, from the Inundations of the *Po*, and shewed so much Skill and Judgment in the Management of that Affair, that obtained him great Applause; and, in Consequence of his incomparable Talents displayed in a Variety of interesting and important Affairs, *Marius Obigi*, Brother of Pope *Alexander VII.* appointed him Inspector-general of the Fortifications of the Castle of *Urbino*, and likewise of the Rivers in that ecclesiastical State, for several Years: But in all this Time, he did not neglect his astronomical Studies, but cultivated them with great Care. — He discovered many Particulars relative to *Mars* and *Venus*, especially the Revolution of *Mars* round his own Axis: But his principal Point in View was, to settle an accurate Theory of *Jupiter's* Satellites, which, after much Labour and Watching, he happily effected, and published it, at *Rome*, among other astronomical Pieces. — *Picard*, the French Astronomer, getting *Cassini's* Tables of *Jupiter's* Satellites, found them so very exact, that he conceived the highest

Opinion of his Skill, and published his Fame in the Royal Academy of Sciences: And *Lewis XIV*, enamoured with his Fame, invited him to be a Member of the Academy. *Cassini*, however, could not leave his Station at *Bologne* without Leave of his Superiors; and therefore *Lewis* requested of Pope *Clement IX*, and of the Senate of *Bologne*, that *Cassini* might be permitted to come into *France*: And Leave being obtained for six Years, *Cassini* came to *Paris* in 1699, where he was immediately made the King's Astronomer. — When this Term was near expiring, the Pope and Senate of *Bologne* insisted upon *Cassini's* Return, on Pain of forfeiting his Revenues and Emoluments, which had hitherto been remitted to him; but the Minister, *Colbert*, prevailed on him to stay, and he was naturalized the latter End of the Year 1673, about which Time he likewise entered into the Marriage State.

The Royal Observatory at *Paris* had been finished some Time: The Occasion of its being built was, briefly, this: In the Year 1638, the famous *Minim Mersennes* was the Author and Institutor of a Society, where several ingenious and learned Men met together to talk upon physical and astronomical Subjects, among whom were *Gassendus*, *Des Cartes*, *Monmour*, *Thevenot*, *Bullialdus*, our Countryman *Hobbes*, &c. and this Society was kept up by a Succession of such Men for many Years. At length, *Lewis XIV*, considering that a Number of such Men, acting in a Body, would succeed abundantly better in the Promotion of Science, than if they acted separately, each in his particular Art or Province, established, under the Direction of *Colbert*, in the Year 1666, the ROYAL ACADEMY of Sciences; and, for the Advancement of Astronomy in particular, erected the ROYAL OBSERVATORY at *Paris*, and furnished it with all Kinds of Instruments that were necessary to make Observations. The Foundation of this noble Pile was laid in the Year 1667, and the Building compleated in 1670. — *Cassini* was appointed to be the first Inhabitant of the Observatory, who took Possession of it September 1671, when he devoted himself in good Earnest to the Business of his Profession. — In the Year 1672, he endeavoured to determine the Parallax of *Mars* and the *Sun*, by comparing some Observations which he made at *Paris* with some which were made at the same Time in *America*. — In the

the Year 1677, he demonstrated the diurnal Motion of *Jupiter* round his Axis to be performed in 9 Hours and 58 Minutes, from the Motion of a Spot in one of his larger Belts. — In the Year 1684, he discovered four Satellites of *Saturn*, besides that which *Huygens* had found out. — In the Year 1693, he published a new Edition of his Tables of *Jupiter's* Satellites, corrected by later Observations. — In the Year 1695, he took a Journey to *Bologne*, to examine the Meridian Line which he had fixed there in 1653, and he shewed, in the Presence of several Mathematicians, that it had not varied in the least during near 40 Years. — In the Year 1700, he continued the Meridian Line through *France*, which *Picard* had begun, to the extreamest Southern Part of that Country.

We are further informed, by his Son in his *Elements of Astronomy*, that he invented a new Hypothesis, for solving all the Phænomena of the solar Motions, by a Curve somewhat differing from the Form of an Ellipsis: He supposed, that the *Earth* was placed in one of the Focus's of this Curve, and the Sun moved in such a Manner about it, that, if two Lines were drawn from its Centre to the two Focus's of the Curve, the Rectangle made of these two Lines would always be equal to the Rectangle made by the greatest and least Distance of the *Sun* from the *Earth*; his Anomaly, true Place, and Equation of the Orbit, are all readily determined thereby, and to a very great Degree of Exactness, as appears from an Example he hath given us, Vol. I. p. 151. of his *Astronomy*.

After *Cassini* had lived in the Royal Observatory more than 40 Years, and done great Honour to himself and his Royal Master, by many excellent and useful Discoveries, which he published from Time to Time, he died the 14th of *September*, 1712, aged 87 Years and a Half, and was succeeded by his Son, *John Cassini*.

In the last Years of his Life he lost his Sight, a Misfortune that likewise befel the great *Galileo*; whence the Author of the Eulogium on *Cassini*, in *French*, observes, that these two Men were, in some Measure, similar to *Tiresias* in the Fable, who was said to be struck Blind for having presumed to pry into the Secrets of Nature, beyond what was permitted to Man.

The LIFE of JOHN BLAGRAVE.

JOHAN BLAGRAVE was an eminent *English* Mathematician, born at *Bulmarsh-court* in *Berkshire*; he received the Rudiments of his Education at *Reading*, from whence he removed to *St. John's College, Oxford*: He soon quitted the University and retired to *Southcote-lodge*, where he devoted himself to Study and Contemplation; his Genius seemed most to be turned to Mathematics, and, that he might make the greater Progress in this Science, he addicted himself to a retired Life. He employed himself chiefly in compiling such Works as might render speculative Mathematics accurate, and the practical Parts easy, and was very assiduous in recommending these Studies to Gentlemen of Abilities and Leisure, as they were not mere Amusements for Scholars, and speculative Persons, but of general Advantage in the necessary Affairs and Business of Life. Nor did he stop in barely recommending those Studies by Arguments drawn from hence, but encouraged it by his Liberality and peculiar Marks of his Favour. There were many Acts indeed of his Beneficence in private Life, for the Incouragement of Learning, the Reward of Merit, and the Relief of Distress: Some of these were the Result of a quaint, humourous Disposition, discovered especially by his Legacies: One of which was, bequeathing 10 Pounds a Year for three virtuous Maids who had lived five Years with a Master, who were to appear before the Mayor of *Reading* on *Good Friday* and cast Dice; she who cast the highest Number had the 10 Pound-purse, which generally procured the Girl a Husband; and the other two were to have the Chance of casting the succeeding Year, and even a third Year if unfortunate. He likewise demised, and bequeathed a stipend to eighty poor Widows who should attend annually on *Good Friday* and hear a Sermon, for which he left 10s. to the Parson. He took particular Care likewise to provide for those of his Family, to reward the Diligence and Fidelity of his Servants, and provide amply for their Support. So that Knowledge and a great Genius were joined with a laudable Desire of doing good, and promoting the Happiness of Mankind. We have no mention made of the

Time of his Birth, or Age; but History mentions, that Mr. *Blagrove* died at his own House near *Reading*, *August 9, 1611*, and lies interred in the Church of *St. Lawrence*, with a fine Monument, to his Memory, representing a Man under an Arch to the Middle, holding one Hand on a Globe, and the other on a Quadrant. He is habited in a short Cloak, a Cassock, and Ruff, surrounded with Books: On each Side are the Figures of two Women, presenting him with mathematical Instruments: With this Inscription.

Johannes Blagrove, totus Mathematicus, cum matre Sepultus.

His Works indicated his indefatigable Studies in the mathematical Sciences, which were principally four Books, *viz.*

I. A mathematical Jewel; shewing the making, and most excellent Use of an Instrument so called; for leading the direct Path-way through the whole Art of Astronomy, Cosmography, Geography, &c. printed at *London* in Folio, 1585.

II. Of the Making and Use of the familiar Staff: So called, as it is adapted to walk with, and to perform the geometrical Mensuration of all Altitudes, 4to. 1590.

III. The Use of the Astrolabe, 4to. 1596.

IV. The Art of Dialling, in two Parts, in 4to. 1609.

The LIFE of FRANCIS BLONDEL.

FRANCIS BLONDEL is famous in History for his uncommon Skill in the Sciences of Mathematics and Architecture, and for the honorary Dignities conferred on him in Consequence thereof; for when he was but young, with respect to Years, he was such an Adept in his Profession, as to be chosen *Regius* Professor of Mathematics and Architecture, at *Paris*. — Not long after, he was appointed Governor to *Lewis Henry de Lomenix*, Count de *Brienne*, whom he accompanied in his Travels from *July, 1652*, to *November, 1655* (of which he published an Account.) — He had many honourable Employments

ployments conferred on him both in the Army and Navy : — Entrusted with the Management of several Negotiations with foreign Princes : — He arrived at the Dignity of Marshal *de Camp*, and Councillor of State, and had the Honour to be appointed mathematical Preceptor to the *Dauphin*. He was Director of the Academy of Architecture, and a Member of the Royal Academy of Sciences. In all which, he supported his Character with Dignity and Applause. He drew the Designs of the new Gates, since the *Dutch War* in 1672, and wrote some of the Inscriptions on them ; for he was no less versed in the Knowledge of the *Belles Lettres* than in that of Geometry, as may be seen by the Comparison he published between *Pindar* and *Horace* : It is very remarkable that, in most, if not all his polemical Tracts, he aimed at explaining and recommending Authors, more than exposing their Foibles and display his own Vanity ; and in the less important miscellaneous Pieces which he wrote, he constantly paid a Regard to the Improvement, as well as Entertainment of his Readers. In his *Latin Account* of his Travels he has interspersed a great Variety of judicious Observations on the Laws, Customs, Manners, &c. of the Nations he had visited ; and thus made the History peculiarly beneficial to Readers. He died *February 1, 1686*, in an advanced Age : But History does not precisely mention where.

His principal mathematical Works were,

I. Notes on the Architecture of *Savot*.

II. A Course of Architecture, in 3 Vol. Fol.

III. The Art of throwing Bombs.

IV. The History of the *Roman Calendar*.

V. A new Method of Fortification.

The LIFE of JOHN ALPHONSO BORETTI.

JOHN ALPHONSO BORETTI, a famous Philosopher and Mathematician, born at *Naples* the 28th of *January*, 1608; he was Professor of Philosophy and Mathematics in some of the most celebrated Universities in *Italy*, especially at *Florence* and at *Pisa*, where he became highly in Favour with the Princes of the House of *Medicis*; but having been concerned in the Revolt of *Messina*, he was obliged to retire to *Rome*, where he spent the Remainder of his Life under the Protection of *Christiana*, Queen of *Sweden*, who honoured him with her Friendship, and, by her Liberality towards him, softened the Rigour of his hard Fortune. He continued two Years in the Convent of the regular Clergy of *St. Pantaleon*, called *the pious Schools*, where he instructed the Youth in mathematical Studies. And this Study he prosecuted with the utmost Diligence for many Years afterwards, as is evident by his Correspondence with several ingenious Mathematicians of that Age, and the frequent Mention of him by others who have endeavoured to do Justice to his Memory. He wrote a Letter to the learned Mr. *John Collins*, wherein he discovers his great Desire and Endeavours to promote the Improvement of those Sciences; speaks of his Correspondence with, and great Affection to Mr. *Henry Oldenburg*, Secretary of the Royal Society; — of Dr. *Wallis*; of the late learned Mr. *Boyle*, and regretted the great Loss thereby sustained to the common Wealth of Learning: — Mr. *Baxter*, in his *Enquiry into the Nature of the human Soul*, makes frequent Use of our Author's Book *De Motu Animalium*, and tells us, that he was the first who discovered that the Force exerted within the Body prodigiously exceeds the Weight to be moved without, or that Nature employs an immense Power to move a small Weight: But he impartially acknowledges that Dr. *James Keil* had shewn our Author was mistaken in his Calculation of the Force of the Muscles of the Heart; he nevertheless ranks him with the most authentic Writers, and seldom mistaken; and having remarked that

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that it is so far from being true, that great Things are brought about by small Power; that, on the Contrary, a stupendous Power is manifested in the most ordinary Appearances of Nature. He tells us, that the ingenious *Borelli* first observed this in animal Motion; and that *Dr. Stephen Hales*, by a Course of Experiments in his vegetable Statics, had shewn the same in the Force of the ascending Sap in Vegetables.

After a Course of unwearied Labours, we find *Borelli* died at *Pantaleon* of a Pleurisy, Dec. 31, 1679, aged 72 Years.

Borelli, besides several Books on physical Subjects, published the following mathematical ones, viz. I. *Euclid* restored, 4to. II. The Vth, VIth, and VIIth Book of *Apollonius's* Conics; with some Tracts of *Archimedes*, Folio. III. The Theory of the secondary Planets, or Moons of *Jupiter*, deduced from physical Causes, 4to. IV. Concerning the Force of Concussion, 4to. V. Of the natural Motions of Bodies, resulting from Gravity. VI. Various Observations of lunar Eclipses. VII. *Apollonius's* Elements of Conic Sections, and those of *Archimedes*. VIII. Observations on the unequal Strength of the Eyes. IX. Observation on the Eclipse of the Moon of the 11th of *January*, 1675. X. An historical and meteorological Account of the Burning of *Mount Ætna*, in the Year 1669.

ERRATUM.

At the Beginning of this Life, for *Boretti* read *Borelli*.

The LIFE of THOMAS HARIOT.

THOMAS HARIOT, an *English* Mathematician, was born at *Oxford* in the Year 1560, and after he had been instructed in Grammar-learning in that City, he became a Commoner in *St. Mary's Hall*, where he took a Bachelor of Arts Degree in 1579; he had then so distinguished himself by his uncommon Skill in Mathematics, as to be recommended, soon after, to *Sir Walter Raleigh*, as a proper Preceptor to him in the Science, who accordingly became his first Patron, took him into his Family, and allowed him a handsome Pension: In 1585, he was sent over by *Sir Walter*, with his first Colony, to *Virgi-*

nia, where, being settled, he was employed in discovering and surveying that Country, in observing what Commodities it produced, together with the Manners and Customs of its Inhabitants, which he published an Account of under the Title of, *a brief and true Report of the New-found-land of Virginia*: Which was re-printed in the 3d Volume of *Hakluyt's Voyages*. Upon his return to *England*, he was introduced, by his Patron, to the Acquaintance of *Henry Earl of Northumberland*, who, finding him to be a Gentleman of an affable and peaceable Disposition, and well read in many valuable Parts of Learning, allowed him a generous Pension, as he did afterwards to Mr. *Hues*, (well known by his Treatise upon the Globes) and to Mr. *Walter Warner*, who is said to have made some accurate Observations on the Circulation of the Blood, and to have communicated some Hints thereof to the famous Mr. *Harvey*; so that in 1606, when the Earl was committed to the Tower for Life, *Hariot*, *Hues*, and *Warner* were his constant Companions, and commonly called the Earl of *Northumberland's* three *Magi*, with whom the Earl did frequently converse; as did also Sir *Walter Raleigh*, who was then in the Tower, to divert and sooth them in their melancholy Confinement. Mr. *Hariot* removed sometime afterward to *Sion College*, and died in *London*, June 2d, 1621, of a Cancer in his Lip. A Manuscript of his entitled, *Ephemeris Chrytometrica*, is preserved in *Sion College Library*; and his *Artis Analyticæ Praxis* was printed, after his Death, in a thin Folio, and dedicated to *Henry Earl of Northumberland*. *Des Cartes* is said to be obliged to this Book for a great many of his Improvements in Algebra. — He was universally esteemed on Account of his Learning; when he was but a young Man, *Hakluyt* styles him *Juvenis in disciplinis Mathematicus excellens*; and, by *Camden*, *Mathematicus insignis*. Mr. *George Chapman* likewise styles him, his worthy and most learned Friend, whose Judgment, and Knowledge, says he, I know to be incomparable, yea, to be admired as well for his most blameless Life, as the wise Disposition and Improvement of his Time: And Dr. *Richard Corbet*, afterward Bishop of *Oxford*, in his Poem to Sir *Thomas Aylesbury*, speaks of

——— *Deep Hariot's Mine,*
In which there is no Dross, but all Refine.

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These Encomiums we rather mention, as some Authors have attached to his Character, that of *Deist*, and that he undervalued the Authority of the Scriptures; which does not appear at all probable, from the high Esteem he was in with Persons of reverend and distinguished Characters.

The LIFE of LAURENCE ROOKE.

LAURENCE ROOKE sprung from a good Family of that Name, at *Monks Horton* in *Kent*, but was himself born at *Deptford* in 1623, in that County. He was educated at *Eaton School*, and from thence removed to *King's College* in 1639: He seems to have been a Valetudinarian while at the College; for we find, that on the 29th of *February*, 1643, he was admitted to his Bachelor's Degree in Arts, by Proxy; and in 1647, he commenced Master of Arts, and then retired into the Country: But in the Year 1650, he went to *Oxford*, and settled in *Wadham College*, for the Sake of having the Company, and receiving Improvement from Dr. *Wilkins*, and Mr. *Seth Ward* the Astronomy Professor; and likewise that he might accompany Mr. *Boyle* in his chymical Operations.

After the Death of Mr. *Foster*, he was chosen Astronomy Professor in *Gresham College*; upon the 23d of *July*, 1652, he made some Observations upon the Comet at *Oxford*, that appeared in the Month of *December* that Year, which, the Year following, were printed by Mr. *Seth Ward*; and in the Year 1655, Dr. *Wallis* published his Treatise *De Sectionibus Conicis*, which he dedicated to those two Gentlemen.

On the 7th of *August*, 1657, Mr. *Rooke* was permitted to exchange the Astronomy Professorship for that of Geometry: This might seem very strange, as Astronomy still continued to be his favourite Study; but it appears to be from a Conveniency of the Lodgings, which opened behind the Reading-hall. — Mr. *Rooke* having thus successively enjoyed those two Places some Years before the Restoration in 1658, most of those Gentlemen who were wont to assemble at *Oxford*, coming to *London*, join-
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ing with other of their Acquaintance, usually met at *Gresham College* to hear Mr. *Rooke's* Lectures. After the Royal Society came to be formed and settled into a regular Body, Mr. *Rooke* was very zealous and serviceable in promoting that great and useful Institution, but did not live till it received its Establishment by the Royal Charter. The Marquis of *Rocheſter*, who then reſided at *Highgate*, had taken Mr. *Rooke* to his Seat: But while there, he over-heated himſelf and caught Cold, which coſt him his Life. One very unfortunate Accident attended his Death, that it happened on the very Night which he had, for ſome Years, expected, wherein to finiſh his accurate Obſervations on the Satellites of *Jupiter*. And when his Illneſs prevented his Obſervation, Dr. *Pope* ſays, he ſent to the Society his Requeſt, that ſome other Perſon, properly qualified, might be appointed for that Purpoſe; ſo intent was he to the laſt, for making thoſe curious and uſeful Discoveries, in which he had been ſo long engaged. Mr. *Rooke* died in his Apartment, at *Greſham College*, the 27th of *June*, in 1662, at the Age of 41, and made a Noncupatory Will, leaving what he had to Dr. *Ward*, permitting him to receive what was due to him upon Bond, &c. and could be eaſily had; but no Bonds were to be put in Suit. He was buried very decently, by Biſhop *Ward*, at the Church of *St. Mary Outwich*, in *Biſhopsgate-ſtreet*, and his Corps attended by all the Fellows of the Royal Society then in *London*. Few Perſons have left behind them a more agreeable Character than Mr. *Rooke*, from all who were acquainted with him, or his Endowments; but in nothing more, than for his Veracity; for what he aſſerted poſſitively may be relied on: But if his Opinion was aſked, concerning any Thing that was dubious, his uſual Answer was, *I have no Opinion*. Mr. *Hooke* has given this copious, though concise Character of him: “I never was acquainted with any Perſon who knew more, and ſpoke leſs, being, indeed, eminent for the Knowledge and Improvement of *Aſtronomy*” Dr. *Wren*, and the Lord Biſhop of *Exeter* deſcribes him, as a Man of profound Judgment, a vaſt Comprehension, prodigious Memory, and ſolid Experience. His Skill in the Mathematics was revered by all the Lovers of thoſe Studies, and his Perfection in many other Sorts of Learning deſerves no leſs Admiration; but, above all, as another Writer characterizes

rizes him, his extensive Knowledge had a right Influence on the Temper of his Mind, which had all the Humility, Goodness, Calmness, Strength, and Sincerity of a sound, unaffected Philosopher. These Accounts give us his Picture only in Minuature: But his Successor, Dr. *Isaac Barrow*, has drawn it in full Proportion, in his Oration at *Gresham College*, which is too long to insert in this Place.

His Writings were principally:

I. Observations on Comets.

II. Directions to Seamen going to the *East* or *West-Indies*.

III. The Method of observing the Eclipses of the Moon.

IV. A Discourse concerning the Observations of the Eclipses of the Satellites of *Jupiter*. — These are printed in the *Transactions* of the Royal Society, besides which he published some other Papers of his Experiments, &c.

The LIFE of CHRISTOPHER WREN.

CHRISTOPHER WREN descended from an antient Family in *Binchester*: He was born at *East Knoyle*, in *Wiltshire*, on the 20th of *October*, 1632, and, while very young, discovered a surprizing Genius for Learning, and particularly the Mathematics. He was sent to *Oxford*, and admitted a Gentleman-commoner at *Wadham College* at about 14 Years of Age, and the Advancement he there made in mathematical Knowledge, before he was 16 Years old, is very remarkable, as related by the celebrated Mr. *Oughtred*. — He took the Degree of Bachelor of Arts on the 18th of *March*, 1650, being then in his 19th Year: In the Beginning of *November*, 1653, he was chosen a Fellow of *All Souls College*; and, upon the 11th of *December* following, took his Degree of Master of Arts, before he left *Wadham College*; and soon after he became a Member of that excellent Society who then met at *Oxford* for the Improvement of natural and experimental Philosophy.

Upon Mr. *Rooke*'s removal to the Geometry-professorship in *Gresham College*, he was chosen to succeed him as Professor of

Astronomy, *August* 7, 1657, in the 25th Year of his Age. In his Oration made on that Occasion, among other Things, he proposes several Methods whereby to account for the Shadows returning backward ten Degrees on the Dial of King *Abaz*, by the Laws of Nature. — His Lectures, which were read on *Wednesdays* in Term-time, used to be attended by many eminent and learned Men, who were principally the Auditors of Mr. *Rooke*. — One Subject of those Lectures was upon Telescopes, to the Improvement of which he had greatly contributed. — Not long after, he made some Discoveries relating to the Air, of which Mr. *Hooke* has given us the following Account: “ The Instrument for finding the different Pressure of “ Air upon the Parts of the Earth subjacent, was first observed “ by the Hon. Mr. *Boyle*, who, upon the Suggestion of Sir “ *Christopher Wren*, erected a Tube of Glass so filled with Mer- “ cury as is now usually done in the common Barometer, in “ order to find out whether the Pressure of the Moon, accord- “ ing to the *Cartesian* Hypothesis, did affect the Air; instead “ of finding the Fluctuation which might cause the Phænomena “ of the Tides, discovered the Variation of the Air’s Pressure to “ proceed from different Causes, and at different Times, from “ what that Hypothesis would have predicted.” This Property of the Air, for ought appears, was never discovered till that Time, which is little more than 100 Years ago. Mr. *Derham*, who published it, thinks these Observations were made at *Oxford*, about the Year 1658. — In that Year Mr. *Wren*, in one of his Lectures at *Gresham College*, read a Description of the Body, and different Phases of the Planet *Saturn*; which Subject he proposed to investigate while his Colleague, Mr. *Rooke*, then Professor of Geometry, was carrying on his Observations upon the Satellites of *Jupiter*: And in the Month of *July*, that Year, he communicated some Demonstrations concerning Cycloids to his Friends, and, among others, to Dr. *Wallis*, which were afterwards published by the Doctor at the End of his Treatise on that Subject. — About the same Time also, he solved the Problem proposed by the famous Mons. *Pascal*, under the feigned Name of *Jean de Montfret*, to all the *English* Mathematicians, and returned another to the Mathematicians in *France* formerly proposed by *Kepler*, and then solved like-

The Life of CHRISTOPHER WREN. 315

likewise by Mr. *Wren*, of which they never gave any Solution. — In the Year 1660, he invented a Method for the Construction of solar Eclipses. — November 28, that Year, he with ten others, formed themselves into a Society, to meet every *Wednesday*, for the Improvement of natural and experimental Philosophy. — Mr. *Wren* did not continue long at *Gresham College*, for, on the 5th of *February* following, being chosen *Savilian* Professor of Astronomy at *Oxford*, in the Room of Dr. *Seth Ward*, he resigned his *Gresham* Professorship the 8th of *March* following, and upon the 16th of *May*, 1661, entered upon the other.

September 12, the same Year, he was created Doctor of the Civil Law, in which he appears to have had such a competent Knowledge as to have greatly exceeded the Expectations of his Friends.

Among his other Accomplishments, he had gained so considerable a Skill in Architecture, that he was sent for, the same Year, from *Oxford*, by Order of King *Charles II.* to assist Sir *John Denham*, Surveyor-general of his Majesty's Works.

May 20, 1663, he was chosen a Fellow of the Royal Society, being one of those who were first appointed by the Council after the Grant of their Charter; and not long after, it being expected that the King would make the Society a Visit, the Lord *Brouncker*, then President, by Letter, desired Dr. *Wren's* Advice, who was then at *Oxford*, what Experiments would be most proper for his Majesty's Entertainment. To whom the Doctor, in his Answer, dated *July* 30, 1663, recommends principally the *Torcellian* Experiment, and the Weather-Needle, as being not bare Amusements, but useful, and likewise neat in their Operation. The noble Institution of this illustrious Body, Dr. *Wren* greatly promoted, by many curious and useful Discoveries in Astronomy, natural Philosophy, and other Sciences, related in the History of the Royal Society, where the ingenious Author Mr. *Thomas Sprat*, who was then a Member of it, has given the following Account of them, taken from the Registers and other Books of the Society to the Year 1665, although that History was not published till 1667.

The first Instance (says he) which I shall mention to which he may lay peculiar Claim, is the *Doctrine of Motion*, which is the most considerable of all others for establishing the first Principles of Philosophy by geometrical Demonstrations. Dr. Wren produced before the Society an Instrument to represent the Effects of all Sorts of Impulses made between two hard globous Bodies, either of equal or of different Bigness and Swiftneſs, following or meeting each other, or the one moving and the other at reſt. From theſe Varieties aroſe many unexpected Effects, of all which he demonſtrated the true Theories, after they had been confirmed by many Experiments. Theſe he propoſed as the Principles of all Demonſtration in natural Philoſophy. Nor can it ſeem ſtrange, that theſe Elements ſhould be of ſuch univerſal Uſe, if we conſider, that Generation, Corruption, Alteration, and all the Viciffitudes of Nature are nothing elſe but the Effects ariſing from the Meeting and inteſtine Motion of little Bodies of different Figures, Magnitudes and Velocities.

The ſecond Work which he has advanced, is *the Hiſtory of Seasons*, which will be of admirable Benefit to Mankind if properly attended to. His Propoſal was, to comprehend a Diary of Wind, Weather, and other Conditions of the Air, as to Heat, Cold, and Weight; and alſo a general Deſcription of the Year, whether healthful or contagious to Men or Beaſts; with an Account of epidemical Diſeaſes, of Blaſts, Mill-dews, and other Accidents belonging to Grain, Cattle, Fiſh, Fowl, and Inſects: And becauſe the Difficulty of a conſtant Obſervation of the Air, by Night and Day, ſeemed invincible, he therefore deviſed a Clock to be annexed to a Weather-cock which moved a Rundle covered with Paper, upon which the Clock moved a black-lead Pencil, ſo that the Obſerver, by the Traces of the Pencil on the Paper, might certainly conclude what Winds had blown in his Abſence. After the like Manner, he contrived a Thermometer to be its own Register; and becauſe the uſual Thermometers were not found to give a true Meaſure of the Extention of the Air, by reaſon that the accidental Gravity of the Liquor, as it lay higher or lower in the Glaſs, weighed unequally on the Air, and gave it a farther Conſtruction or Extention, over and above that which was produced by

Heat

Heat and Cold, therefore he invented a circular Thermometer, in which the Liquor occasions no Fallacy, but remains always in one Height, moving the whole Instrument like a Wheel on its Axis.

He contrived an Instrument to measure the Quantity of Rain that falls: This, as soon as it is full, will pour out itself, and, at the Year's End, discover how much Rain has fallen on a given Space of Land, in order to the Theory of Vapours, Rivers, Seas, &c.

He devised many subtle Ways for the easier finding the Gravity of the Atmosphere, the Degrees of Drought and Moisture, and many of its other Accidents. Amongst these Instruments, there are Balances which are useful to other Purposes, that shew the Weight of the Air by their spontaneous Inclination.

He made great Additions to the new Discoveries on Pendulums, and among other Things shewed, that there may be produced a *natural* STANDARD for Measure from the Pendulum for vulgar Use.

He has invented many Ways to make astronomical Observations more accurate and easy. He has fitted and hung Quadrants, Sextants, and Radii more commodiously than formerly. He made two Telescopes to open with a Joint like a Sector, by which Observers may infallibly take a Distance to half Minutes, and find no Difference in the same Observations reiterated several Times.

He has added many Sorts of Retes, Screws, and other Devices, for Improvement of Telescopes for taking small Distances, and apparent Diameters, to Seconds. He made Apertures for taking in more or less Light, as the Observer pleases, by opening and shutting like the Pupil of the Eye, the better to fit Glasses for crepusculine Observations. ——— He has added much to the Theory of Dioptrics, much to the Manufacture of grinding good Glasses. He has attempted, and not without Success, the making of Glasses of other Forms than spherical. ——— He has exactly measured and delineated the Spheres of the Humours in the Eye, whose Proportions one to the other were only guessed at before. This accurate Discussion produced the Reasons why

we see Things erected, and that Reflection conduces as much to Vision as Refraction.

He displayed a natural and easy Theory of Refraction, which exactly answered every Experiment. — He fully demonstrated all Dioptrics in a few Propositions, shewing not only, as in *Kepler's* Dioptrics, the common Properties of Glasses, but the Proportions by which the individual Rays cut the Axis, and each other, upon which the Charges of the Telescopes, or the Proportion of the Eye-glasses and Apertures, are demonstrably discovered.

He made constant Observations on *Saturn*, and a Theory of that Planet truly answering all Observations, before the printed Discourse of *Hugenius*, on that Subject, appeared.

He has essayed to make a true Selenography by Measure, the World having nothing yet but Pictures, rather than Surveys or Maps of the Moon. He has stated the Theory of the Moon's Libration, as far as his Observations could carry him. He has composed a lunar Globe, representing not only the Spots and various Degrees of Whiteness upon the Surface, but the Hills, Eminencies, and Cavities moulded in solid Work. The Globe, thus fashioned into a true Model of the Moon, as you turn it to the Light, represents all the menstrual Phases, with the Variety of Appearances that happen from the Shadows of the Mountains and Valleys.

This lunar Globe was formed not only at the Request of the Royal Society, but likewise by the Command of King *Charles II.* whose Pleasure for the Prosecution and perfecting of it was signified by a Letter under the joint Hands of Sir *Robert Moray* and Sir *Paul Neile*, and his Majesty's Approbation of it, when finished, was such, that he ordered it to be placed among the Curiosities of his Cabin, and bestowed on him Marks of his royal Favour. He made Maps of the *Pleiades* and other telescopic Stars, and proposed Methods to determine the great Doubt of the Earth's Motion, or Rest, by the small Stars about the Pole to be seen in large Telescopes.

In order to Navigation, he has carefully pursued many magnetical Experiments, of which the following is one of the noblest and most fruitful of Speculation: A large Terella is placed in
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the midst of a plane Board with a Hole, into which the Terella is half immersed, till it be like a Globe with the Poles in the Horizon. Then is the Plane dusted over, with Steel-filings, equally from a Sieve. The Dust, by the magnetical Virtue, is immediately figured into Furrows that bend like a Sort of Helix, proceeding as it were out of one Pole and returning into the other. And the whole Plane is thus figured like the Circles of a Planisphere.

It being a Question at this Time among the Problems of Navigation very well worth resolving, to what mechanical Powers sailing against the Wind was reducible; he shewed it to be a Wedge. And he demonstrated, how a transcient Force upon an oblique Plane would cause the Motion of the Plane against the first Mover; and he made an Instrument that mechanically produced the same Effect, and shewed the Reason of Sailing to all Winds.

The geometrical Mechanics of Rowing, he shewed to be a Vectis on a moving, or cedent Fulcrum. For this End, he made Instruments to find what the Expansion of Body was towards the Hindrance of Motion in a liquid Medium, and what Degree of Impediment was produced, by what Degree of Expansion, with other Things that are the necessary Elements for laying down the Geometry of Sailing, Swimming, Rowing, Flying, and the Fabrics of Ships.

He invented a very speedy and curious Way of Etching. He started many Things towards the Emendation of Water-works. He likewise made some Instruments of Respiration, and for straining the Breath from fuliginous Vapours, to try whether the same Breath, so purified, will serve again.

He was the first Inventor of drawing Pictures by microscopical Glasses. He found out perpetual, at least long lived Lamps, for keeping a perpetual regular Heat, in order to various Uses, as hatching of Eggs, Insects, Production of Plants, chymical Preparations, imitating Nature in producing Fossils and Minerals, keeping the Motion of Watches equal in order to Longitudes and astronomical Uses, and infinite other Advantages.

He was the first Author of the noble anatomical Experiment of injecting Liquor into the Veins of Animals; an Experiment now com-

commonly known, but long since exhibited to the Meetings at *Oxford*, and thence carried by some *Germans* and published abroad. By this Operation diverse Creatures were immediately purged, vomited, intoxicated, killed, or revived; according to the Quality of the Liquor injected. Hence arose many new Experiments, and chiefly that of transfusing Blood, which has been prosecuted in sundry Instances that will probably end in extraordinary Success.

This is a short Account of the principal Discoveries which *Dr. Wren* presented, or suggested to the Royal Society. Some of these, it must be acknowledged, were before invented, and by him improved: Others suggested by him, and carried to greater Perfection by the Industry of other Hands. We do not purpose to rob him, or them, of their due Honour; but so far as the Invention or Improvement appears to be his, the Mention of them is a just Tribute due to his Memory; which he was so far from usurping the Fame of from other Men, that he often endeavoured to conceal his own Name.

In the Year 1665, he went over to *France*, where he not only surveyed all the Buildings of Note, but took particular Notice of what was most remarkable in every Branch of Mechanics, and, according to his own Expressions in a Letter, greatly enlarged his Knowledge and refined his Taste in Architecture. Upon his return Home, he was appointed Architect, and one of the Committee for Repair of the Cathedral Church of *St. Paul*. Within a few Days after the Fire of *London*, 1666, he drew a Plan for a new City, and presented it to the King, who produced it himself before his Council and manifested much Approbation of it: Which Model was likewise laid before the Parliament. This Model of *Dr. Wren's* was so formed, that the chief Streets were to cross each other at right Angles, with lesser Streets between them; the Churches, public Buildings, &c. so disposed, as not to interfere with the Streets, and four Piazza's placed at proper Distances. This Plan was engraved from the Author's own Draught by *H. Hulsbergh*, 1724; but though the Parliament, &c. did not agree to the Plan he proposed, History acknowledges it reflected a Lustre on his Character: And, upon the Decease of *Sir John Denham*, 1668, he succeeded him in
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the Office of Surveyor General of his Majesty's Works. And the Theatre at *Oxford* will be a lasting Monument of his great Abilities, besides *St. Stephen's Church* at *Walbrooke*, that of *St. Mary le Bow*, and the Cathedral of *St. Paul*, which have more immediately engrossed the Attention of the Public. The Variety of Business in which he was engaged, preventing his constant Attendance, he resigned his *Savillian* Professorship at *Oxford*, April 9, 1673, and the Year following he received, from his Majesty King *Charles*, the Honour of Knighthood.

Some Time after, he married the Daughter of Sir *Thomas Cogghill*, by whom he had one Son : She dying soon after, he married a Daughter of the Right Hon. *William*, Lord *Fitz-William*, by whom he had two Children, a Son named *William*, and a Daughter of her Name. ——— In the Year 1680, he was chosen President of the *Royal Society*. — In 1684, he was appointed Architect, and a Commissioner of *Chelsea College*. He sat twice as Representative in Parliament, viz. for *Plimpton* in *Devonshire* in 1685, and, in 1700, for *Melcombe Regis* in *Dorsetshire*. He was appointed Surveyor of the Abbey in 1698, and continued that Office 'till April 1718 ; on which Accounts he resided sometimes at *Hampton-Court*, and sometimes at *St. James's* ; but, in removing for his Winter Residence, he is said to have taken a Cold which he never recovered, but died the 25th Day of *February*, 1723, in the 91st Year of his Age. He died, as he lived, with great Calmness and Serenity ; his Funeral attended by Persons of the greatest Distinction, and his Corpse deposited in a Vault under the South Wing of the Choir of *St. Paul*, with the following plain Inscription,

Here lieth

Sir CHRISTOPHER WREN, Knight,

The Builder of this Cathedral Church of *St. Paul*,

Who died in the Year of our Lord 1723,

And of his Age XCI.

The LIFE of Dr. ROBERT HOOKE.

DR. *Robert Hooke*, was an eminent Mechanic, Mathematician, Astronomer, and Optician, of the last Century; and we may very properly introduce the Life of this great Man with a Memorandum found in his Pocket-Diary, dated *April 10, 1697*, in his own Hand, *viz.*

“ I began this Day to write the History of my own Life, wherein I will attempt to comprize as many remarkable Passages as I can now remember, or collect out of such Memorials as I have kept in Writing, or are in the Registers of the *Royal Society*, together with all my Inventions, Discoveries, Experiments, and Discourses, which I have made from Time to Time, with the Success and good Effect of them, &c. &c. according to real Truth and Matter of Fact.” And accordingly we find the Time of his Birth, and some Circumstances of his Youth particularly specified. But the further Account of this, and the more important Memoires of his Life and Actions, on account of his Indisposition, were left to the Care of, and since published by Mr. *Richard Waller*, which are prefixed to his Posthumous Works, from whence we have given the following Abstract: “ Dr. *Robert Hooke* was born at *Freshwater*, on the West Side of the *Isle of Wight*, the 18th of *July*, 1635: That being very weak and infirm, he was nursed at home, and with much Care advanced to the State of Youth, and rendered capable of beginning such an Education as his Father, who was a Clergyman, intended to give him: For his Father, notwithstanding the Weakness of his Constitution, found he had a remarkable Genius, a ready Apprehension, a strong Memory, and a surprizing Invention. After he had learned the *English*, he was soon Master of the *Latin* Grammar; but here he stopped for some Time, from the Interruptions of Illness, and his Father declined any Hopes of seeing him a Man and a Scholar. His Father now concluded to put him to a Watch-maker, a Limner, or some other Mechanical Profession, for which he seemed qualified in some Measure by his natural Genius; but at this Time, when we find he was only 13 Years of Age, his Father

Father died, viz. in *October* 1648." This is the Sum of what he has left under his own Hands. — This early Propensity to Mechanics might probably be assiduously improved by him for some succeeding Years, but we do not meet with any particular Account of him for an Interval of five or six Years, but that he was for some Time with Sir *Peter Lelly*, then with Mr. *Busby* at *Westminster-School*, where he applied himself to the *Latin* and *Greek*, in which he soon made a considerable Proficiency, and at the same Time got some Insight into the Knowledge of the *Hebrew*. — Before he left Dr. *Busby* he fell seriously upon the Study of the Mathematics, in which he took the most regular Method, first making himself Master of *Euclid's* Elements, and afterwards studied their Application.

From *Westminster-School*, he went to the *University of Oxford* in 1653, and took the Degree of Master of Arts about 1660.

About the Year 1655, his Talents became more conspicuous to the World; there being then a great Concourse of People of distinguished Learning, they took great Notice of his Facility in mechanic Invention, and publickly expressed their Approbation of them.

His first Invention, which merited, or at least happily met with popular Esteem, was a Draught of the Air-pump and all its Parts, as it was afterwards published by Mr. *Boyle*.

The same Year, as he himself informs us, he contrived and made many Trials about the Art of flying in the Air, and moving very swift on the Land and Water; but finding, by Trial, that the Muscles of a Man's Body were not sufficient for any Thing of this Kind, &c. he dropt the Attempt.

Soon after, upon some Acquaintance with Dr. *Ward*, he applied himself to the Improvement of the Pendulum, and, in 1656, and 1657, contrived a Way to continue the Motion of the Pendulum, so much commended by *Ricciolus* in his *Almagestum*. — The Success he met with engaged him farther to think of improving it, for finding the Longitude; and the Method he had before tryed led him to the Use of Springs instead of Gravity, for the making the Body vibrate in any Posture. This Attempt he seemed well satisfied might be improved, to answer the Design of it: and on this Account he communicated this Invention to diverse of his Friends, particularly Mr. *Boyle*, and
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craved their Assistance herein ; and a Patent was proposed to be given him as a Reward, but unaccountably the Affair dropt. — However, this Matter produced the Discovery of that most useful and practicable Method of regulating Pocket-watches, by a spiral Spring applied to the Arbor of the Ballance, as they are at present made without any considerable Improvement. — About the Year 1656, he produced a Piece of Watch-work of his own Contrivance, to measure Time more exactly both at Sea and Land, — but there were some Deficiencies ; so that about this Time many curious Experiments, Observations, and Enquiries were made by him, and Instruments contrived for that Purpose, as particularly the Barometer, of which he ingeniously acknowledges the first Rise of the Invention was a Suggestion of Sir *Christopher Wren*, in order to find whether the Hypothesis of *Des Cartes*, for giving the Reason of the Tides from the Pressure of the Moon upon the Air in its Passage by the Meridian were true or not.

About the Year 1657, as he informs us, he applied himself more particularly to the Study of Astronomy, and in 1658 and 1659, he contrived several astronomical Instruments for making Observations both by Sea and Land ; which he afterwards produced before the *Royal Society*. He now contrived the *Circular Pendulum*, and the Use of it for continuing the Motion of another Pendulum, which he likewise shewed to the *Royal Society*, before they were constituted by Royal Charter.

In the Year 1660, this illustrious Society was founded, and Dr. *Hooke* was introduced into their Service, as Curator. In 1661 a Debate arose in the Society about the *Cause of the rising of Water in slender glass Tubes higher than in larger*. This Discourse was wrote and published, and Mr. *Hooke's* Explication of this Phænomenon made him the more regarded. From this Time the Society's Journals gave sufficient Testimonials of his Performance ; to which we refer the Curious. Some of them are,

Experiments of breaking glass Bubbles inward, with Observations thereon, before the Society. — Other Experiments to explicate the Nature and Quality of the Air, viz. as to its Gravitation, its different Effects when rarified, condensed and natural, with its Use as to the Life of Animals, and maintaining

a lucid Flame, or cause the Dissolution of Bodies by Fire; a live Animal and Lamp being inclosed together in a Receiver, shewed the *Pabulum Vitæ*, and *Flamma* to be much the same. At which Time he made the Experiment of keeping a Dog alive, his *Thorax* being laid open, by blowing fresh Air into his Lungs;* which plainly shews the Use of the Air, and Difference between venal and arterial Blood.

He shewed what Addition of Weight is given to Fluids by ascending and descending Bodies in them. — The different specific Weight of hot and cold Water, with the Uses to be made thereof. — Of the Difference of Ice and Water, with the Refraction of other Fluids, by a particular Instrument adapted to that Purpose, which is described in his *Preface* to his *Micrography*. — Other Experiments and Contrivances, to shew the Force and Velocity of Bodies falling from several Heights, Pendulums of 200 Feet long, the Difference of the Barometer at several Heights; — Experiments to improve Land-Carriages; Methods of conveying secret and quick Intelligence; — Instruments to measure Time exactly, to the Second of a Minute by the Sun or Stars; — to try the Strength of Gun-powder; — an Engine for cutting the Teeth of Watch-wheels, an Invention of great Accuracy and now in constant Use.

About this Time he fixed the Standard for the Thermometer from the Point of Freezing, and contrived a Way for making the Motions of the Barometer more sensible.

In *February*, 1663, he contrived a Way to supply fresh Air to the *Urinator* under the Diving-bell, by a Chain of Buckets, and a leaden Box for his Head when he went out of the Bell, to be supplied with fresh Air from the Bell.

In *July*, 1664, he produced an Experiment to shew the Number of Vibrations of an extended String, made in a determinate Time, requisite to give a certain Tone or Note, by which it was found that a *Wire*, making 272 Vibrations in one Second of Time, sounded *G Sol Re Ut* in the Scale of all Music. Other Experiments were made of the Division of a Monichord.

He likewise made several Experiments of the Velocity of Bodies sinking and rising in Water, in order to ascertain that Con-

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trivance,

trivance, which was after made Public, of measuring the Sea's Depth with the Sounding-ball.

At several Meetings of the *Society* in 1664, he produced his microscopical Observations, and read the Explications and Discourses made upon them, which were after published in his *Micrographia*, and greatly admired.

In this Year, Sir *John Cutler* gave a Salary of 50*l.* per Ann. at the Direction of the *Royal Society*, for reading mechanical Lectures. Mr. *Hooke* was accordingly chose, with an additional Salary. These Lectures, and other Collections, were afterwards published.

The generous Ardor of this *Society* continued till the Close of this Year, and some Part of 1665, when, by Reason of a great Mortality, they were obliged to desist their weekly Meetings, till the 14th of *March* 1666.

In this Interim, the Members retired to several Places in the Country: Mr. *Hooke* accompanied Dr. *Wilkins* and some other Gentlemen to *Bansted Downs*, where several Experiments were made during this Recess, an Account of which was brought in to the *Society*.

At their first Meeting in *March*, Mr. *Hooke* produced a very small Quadrant for observing accurately to Minutes and Seconds; it had an Arm moving on it, by Means of a Screw lying on the Limb of the Quadrant.

On *May* 23, Mr. *Hooke* read a Paper, explicating the Inflexion of a direct Motion into a Curve, by a supervening and attractive Principle, which was approved and registered.

August 1, he read his Observations of the Comet in 1664, afterwards published: ——— This produced a Contrivance, to shew that the circular Pendulum was made of two strait Lines crossing each other.

The dreadful Conflagration was now another great Hinderance to the *Society's* Proceedings, so that they removed to *Gresham*: And on the 9th of *Sept.* 1666, he produced a Model for the rebuilding of the City, which was by many competent Judges highly approved.

October 31, 1666, he shewed his inclining Pendulum, with the Uses thereof, to regulate the Motions of a Clock as exactly as by a long one.

On the 9th of *January*, 1666⁶/₇, he having been solicited to prosecute his Observations of the Earth's Parallax, formerly by him proposed, he presented a large Account of the Result of these his Observations to the *Royal Society*, which were afterwards printed in his Attempt to prove the Motion of the Earth, 1667, being the first of his *Cutlerian Lectures* published.

On the 6th of *February* following, he produced his new Lamp, contrived so as to supply the Oil as it wasted, in just Proportion: The farther Description and Explication of which, with many curious Remarks, were published in 1667.

On the 17th of *June* (and some following Days) 1667, he read to the *Society* several Discourses of the Causes, Powers, and Effects of Earthquakes, affirming, that great Hills and Mountains in the World have been raised by them, of which Subject he at several Times afterwards read many other Discourses and Lectures.

In *July*, 1667, he tried several Experiments upon himself, in an exhausted Receiver big enough to contain a Man: This was then thought to be the only Experiment of the Kind that had ever been tried.

About the same Time, he contrived a new Micrometer, of less Charge and Difficulty than that invented by Mr. *Gascoigne*, with Screws. — And the *December* following, he produced some farther Improvements of that Instrument.

January 16, 1667, he produced his new Contrivance of promoting the Vibration of Pendules, so as effectually to prevent all Cheques, which he recommended as a new and great Improvement.

April 9, 1668, he produced two Instruments, whereby the Sense of Hearing might be promoted.

May 14, he exhibited some Experiments, to shew the Degree of the Penetration of Liquors in Oil of Vitriol and Fair-Water.

In this, and some following Months, he read some Discourses about the measuring a Degree of the Earth; he proposed diverse Methods of performing it, and he delivered it as his Opinion, that one of the exactest Ways of Measuring was by making accurate Observations of the Heavens, to a Second, by a perpendicular Tube: And then to take exact Distances by Angles, to

a Second also, which appears to be the Method observed by the *French* not long after : ——— We find also, that he invented a Sort of travelling Calash for that Purpose, which should describe, upon Paper, not only the Mensuration of the Way gone over, but the several Ascents and Descents, together with the Turnings and Windings of the Calash, or the Points of the Compass upon which the Person travelled ; with other Contrivances of this Kind, mentioned in his Journal, which we have not the Pleasure to find were ever published.

In *January* 7, 16⁹⁹₁₀, he first proposed a Drop of Mercury for an universal Standard ; and in *April* following shewed, an Experiment with a Solution of Copper, to represent the Appearance of Clouds and other aerial Meteors, by dropping into it several Salts, &c. ——— and, at the same Time, shewed the Use of introducing the Pictures of Objects into a dark Room for Painting, and contrived a Box for that Purpose like what is now used for taking perspective Views.

In the Year 1671, several Discourses and Papers passed between the learned Mr. *Newton* and Mr. *Hooke* concerning a new Theory of Light and Colours, which was afterward printed.

About this Time he made a Proposition for perfecting all Sorts of Optic-glasses, the Secret of which was delivered in an Anagram to the President, Lord *Brouncker*.

Soon after commenced the Dispute between him and *Hevelius*, concerning the Preference of plain and telescopical Sights for astronomical Instruments, which appears to have been managed with too much Warmth ; which occasioned many other judicious Gentlemen to enter into the Enquiry, and, in some Measure, facilitate a greater Harmony, &c.

In 1674, Mr. *Hooke* produced an Engine, or Instrument, to perform any arithmetical Operation, which met with great Esteem.

The latter End of the same Year, the *Royal Society* kept their weekly Meeting at *Gresham College* again ; and on the 15th of *January*, 1674, he shewed a Way to determine how small an Angle the unassisted Eye is able to discern, by which it was found, that none of the Persons present could see a much less Angle than that of one Minute.

After this Time, a Variety of magnetical Experiments were made by him: He proposed a Theory of the Variation, which was afterward published.

On the 4th of *February* following, he read several Observations and Discoveries relative to the Structure of the Muscles in Animals.

March 18, he made an Experiment of a new Property of Light, having before read some Discourses on this Subject.

Mr. *Oldenburgh*, the Secretary of the *Royal Society*, dying in the Time of their Recess, Mr. *Hooke* was desired to accept the Place, which he did the 25th of *October*, 1677, and the same Day produced his new and curious Water-poise, an Account of which is published in the *Philosophical Transactions*, N^o. 197.

February 167 $\frac{7}{8}$, on Account of Mons. *Gallet*'s Observations of the oval Figure of *Mercury* in the Sun, he gave sundry Reasons for the prolated oval Figure of the Planets: Soon after printed.

He made and presented many curious Observations on Animalculæ in Pepper-water, and other Seeds steeped in Water, confirming Mons. *Lewenhoeck*'s Assertions, and proposed some Improvement of Microscopes.

He likewise produced some Instruments, more accurate than the former, for sounding the Sea's Depth, and bringing up Water, or other Substances from the Bottom.

April 25, 1678, he shewed an Experiment, further to explain the Action of a Muscle, which was, by a Chain of small Bladders fastened together, so as by blowing into one Pipe the whole might be successively filled, and by that Means contracted, supposing the Fibres of the Muscles, which seemed like a Necklace of Pearl in a Microscope, might be filled with a very agile Matter, which he thought most likely to be Air; and likewise read several Discourses, and shewed Experiments, in order to confirm his Theory of Springs and springy Bodies. — He afterwards produced an Invention, to shew the true mathematical Form of all Manner of Arches, for Building, with the true Butment necessary to each of them, &c.

In *August*, 1678, his Grace the Duke of *Norfolk*, having given the *Arundelian Library* to the *Royal Society*, Mr. *Hooke* was chosen an Assistant, or Librarian.

In the Beginning of the Year 1679, several Experiments were repeated, with sundry Improvements, to examine into the Use of the Air in Respiration, by including Animals in common, rarified, and condensed Air; as likewise concerning the Necessity of Air to maintain Fire, &c. some Contrivances were exhibited to explain the different Gravitation of the Air, and to shew that Vapours press only according to their own Gravity, and not according to the Space they take up in the Atmosphere. — Experiments were also made by him, this Year, of the Mixture of Metals, in which there was observed a real Penetration, the *Compositum* being specifically heavier than either of the Metals before Mixture: And also tried some Experiments to shew whether the Earth moved with a diurnal Motion, or not.

In 1680, he produced a new invented Level; and in *November* he read Observations upon the Comet then appearing. — He likewise shewed a Contrivance, by a *Statara*, to examine the attractive Power of the Magnet at several Distances.

In 1681, he read several Lectures of Light, and luminous Bodies. — He likewise produced a new Sea-quadrant, for making Observations with more Accuracy than could be done by any Instrument hitherto known. — After this, he demonstrated a very expeditious Way for drawing the Rhumb-lines exactly true upon a Globe, by an Instrument grounded upon the same Principle with the other.

In 1682, he shewed an Instrument to describe all Sorts of *Helices* upon a Cone, whereby to divide any given Length into almost any Number of equal given Parts: This he apprehended very useful for perfecting astronomical and geographical Instruments: — This he applied to the describing all Variety of Ellipses. — He likewise added some farther Discourses on Light: — Another on Memory; and how we come by the Notion of Time.

After this Time he became more reserved and backward in reading Lectures, or shewing Experiments: But at Length was prevailed on to read a few more Lectures, *viz.* on the unequal diurnal Motion of the Earth, — gave a Description of several Ways of making a portable Sea-barometer. — Other Lectures he read on the Methods of improving sounding Instruments, &c.

In 1691, he was, by Archbishop *Tillotson*, advanced to the Degree of Doctor in Physic. ——— Sometime after, he read a Lecture about the prolated spheroidal Figure of the Sun, and other Phænomena thereof : ——— Of the *Maculæ* and *Faculæ*, &c. ——— of making a Helioscope by four reflecting Planes in a 24 foot Tube ; or a Telescope for viewing Planets and fixed Stars, by two Reflexions in a Tube of 40 Feet, with Monsieur *Huygen's* 120 foot Glass, which was much approved.

The last Lecture our Author mentions him to read was, *June 27, 1698, viz.* upon *Huygen's Cosmotheoros*, and shewed a Module of *Saturn* and his Ring.

From this Time he visibly declined, and his Sight so greatly failed him, that he could not read at all : But waiting his approaching End, he died on the 3d of *March, 1703*, aged 67.

As we have given so particular an Account of his Experiments, which were most considerable in themselves, or brought nearest to Perfection, most of which were published separately, or together, in his Life-time, almost every Year affording some new Productions from his Pen, it would be intirely needless to enumerate all his Publications : The curious Reader may see them particularized in *Ward's Life of the Professors of Gresham College*, in N^o. 35 ; besides his posthumous Works, and several Manuscripts highly esteemed and preserved by *William Jones, Esq*; and others of his Friends, a Variety of his curious Discoveries hath been published, from Time to Time, in the *Philosophical Transactions*.

As to his Person, he made but a mean Appearance, being very small and somewhat crooked ; but he had an active, penetrating, indefatigable Genius, sparing no Pains in Quest of the Truth in Relation to whatever came under his Consideration, of which he made a practical Improvement. In his Life, he always expressed a great Veneration for the eternal and immense Cause of all Beings, as may be seen in many Parts of his Writings : For he seldom received any remarkable Benefit from God, without thankfully acknowledging the Mercy : And whenever he made any considerable Discovery in Nature, invented any useful Contrivance, or found out any difficult Problem, he did not omit setting down, in his Diary, his Acknowledgments to
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omnipotent Wisdom. The Scriptures he likewise studied in the original Language, regarding them as the Rule of his Faith and Practice.

The LIFE of JOHN COLLINS.

JOHAN COLLINS, an eminent Accomptant and Mathematician, was the Son of a non-conformist Divine, was born at *Wood Eaton* near *Oxford*, on the 5th of *March*, 1624; at sixteen Years of Age he was put Apprentice to a Bookseller at *Oxford*; but his Genius became so remarkable for the Study of mechanical and mathematical Sciences, that he was taken under the Tuition of Mr. *Marr*, a Favourite of King *Charles I.* at that Time Clerk of his Majesty's Kitchen: But soon after separated, by Royal Donation, to his Studies, and drew several Dials, which were placed at different Parts, and in different Positions, in the Royal Gardens: And under him Mr. *Collins* made no small Progress in the Mathematics. But the intestine Wars and Troubles increasing, he was obliged to quit that Situation, and then chose to go Abroad, with Intention to prosecute his favourite Study; and, upon his Return, he took upon him the Profession of an Accomptant, and published, in the Year 1652, a large Work entitled, *An Introduction to Merchant's Accompts*, which shewed no small Talents in that Branch of Literature. This was followed by many other Publications on different Branches of Accompts, — and in the Year 1658, he published a Treatise called, *The Sector on a Quadrant*, containing the Description and Use of four several Quadrants, each accommodated to the making of Sun-dials, &c. to which he afterwards added an Appendix, concerning reflected Dialling, from a Glass placed at any Reclination. — In 1659, he published his *Geometrical Dialling*; and the same Year he likewise published his *Mariner's plain Scale new plained*. He now became a Fellow of the *Royal Society* in *London*, and explained and demonstrated to them the Rule, given by the learned Jesuit *De Billy*,

Billy, for finding the Number of the *Julian* Period for any Year assigned, the Cycles of the Sun and Moon, with the *Roman* Indictions for the Years being given. To this he added some well contrived Rules, for the ready finding on what Day of the Week any Day of the Month falls, for ever, and other useful and necessary Calendar Rules, which are published in the *Philosophical Transactions*, N^o. 46, for *April* 1669: And also, a curious Dissertation concerning the Resolution of Equations in Numbers, in the *Transactions*, Number 69, for *March* 1671: And has likewise given a most elegant Construction of a famous Problem, namely, the Distances of three Objects, and the Angles made at a fourth Place in that Plane, by observing each Object, being given, to find the Distance of those Objects from the Place of Observation. — But though these Studies engrossed the principal Part of his Attention, he was not ignorant of, nor unconcerned about the commercial Interest of *Great-Britain*, and wrote several Tracts highly acceptable to the Public, viz. a Plea for bringing over *Irish* Cattle, and keeping out the Fish caught by Foreigners: — For the Promotion of the *English* Fishery: — For the working the Tin-mines: — A Discourse of Salt and Fishery. — But, in 168 $\frac{1}{2}$, he returns again, as it were, to his former Studies, and wrote a Letter to the learned Dr. *Wallis*, wherein he delivered his Thoughts concerning some Defects in Algebra: And it is to him that the World is indebted for the Publication of Dr. *Barrow*'s optical and geometrical Lectures; his Abridgment of *Archimedes*'s Works; of *Apollonius*'s Conics; Mr. *Branker*'s Translation of *Rhombius*'s Algebra, with Dr. *Pell*'s Additions, &c. which were procured by his frequent Sollicitations.

His Fame, as an Accomptant, placed him in an honourary Point of View, and occasioned Application to be made to him in several difficult and important Affairs. While *Anthony*, Earl of *Shaftsbury*, was Lord Chancellor, he was nominated to settle some intricate Accompts in a Cause depending in Chancery: — Afterwards chosen Accomptant to the *Royal Fishery* Company: — Was appointed to inspect the Ground for cutting a River between the *Isis* and the *Avon*; but here, unhappily, he contracted a Disorder by drinking Cyder, when he was too warm,

which ended in his Death, the 10th of *November* 1683, aged 59.

It was a considerable Time after, that his Papers were all delivered into the Hands of the learned and ingenious *William Jones*, Esq; F. R. S. among which were found Manuscripts, upon mathematical Subjects, of Mr. *Briggs*, Mr. *Oughtred*, Dr. *Barrow*, Mr. *Isaac Newton*, and Dr. *Pell*. From a Variety of Letters from these, and many other celebrated Mathematicians, it is evident, that Mr. *Collins* spared neither Pains nor Cost to procure what was requisite to promote real Science: And even many of the late Discoveries in physical Knowledge owe its Improvement to him; for whilst he excited some to make known every new and useful Invention, he employed others to improve them. Sometimes he was peculiarly useful, by shewing where the Defect was in any useful Branch of Science, pointing out the Difficulties attending such Enquiry; and, at other Times, setting forth the Advantages, and keeping up a Spirit and warm Desire for Improvement. Mr. *Collins* was likewise the Register of all the new Improvements made in the mathematical Science, the Magazine to which the Curious had frequent Recourse: It was on this Account that the Learned stiled him the *English Mæcenas*.*

The LIFE of JOHN PELL.

JOHN PELL, an eminent Mathematician, descended from an antient reputable Family in *Lincolnshire*, his Father was Minister at *Southwick* in *Staffordshire*, the Place of our Author's

* It is proper the Reader should be informed, that the Quadrants of which Mr. *Collins* wrote the Description were not of his own Invention, but (as he tells us himself) were at first contrived by his Friend Mr. *Thomas Harvie*, and afterwards perfected by Mr. *Henry Sutton*, who also made them; and have been ever since called *Sutton's Quadrants*; and which for their remarkable Accuracy, extensive Use, and moderate Price, will ever be preferable to all other Quadrants on Wood.

Author's Birth, *March 1, 16¹⁰₁₁*. His Father dying when he was young, his Mother took very early Care of his Education, and he was sent to receive the first Rudiments of Grammar Learning to the Free-school at *Steyning*, under the Care of Mr. *John Jafferis*, where he made so great Proficiency that he was sent to the University at *Cambridge*, as properly qualified, at the Age of thirteen; and though he understood the *Latin, Greek, and Hebrew* Languages extremely well, yet he never stood at any Election of Scholars, or Fellows of his College. His Person was handsome, and his Constitution strong; and therefore scarce ever using Recreations, he prosecuted his Studies with great Vigour. In 1630 he took the Degree of Master of Arts, and the Year following he went to finish his Studies in the University of *Oxford*, where he was received with great Esteem. In 1632 he married *Ilhamaria*, second Daughter of Mr. *Henry Reginolles* of *London*, by whom he had four Sons and four Daughters. Besides the *Latin, Greek, and Hebrew*, he had now made himself Master of the *Arabic, Italian, French, High and Low Dutch*. And in *December, 1643*, he went to *Amsterdam*, where he was appointed Professor of the Mathematics, next after *Martin Hortensius*, and read, with great Applause, public Lectures upon *Diophantus*: As his learned Colleague, *Gerrard John Vossius*, testifies in his Book *De Scientiis Mathematicis*, where he styles him, a Person of various Erudition, and a most accute Mathematician. In 1646, the Prince of *Orange* sent for him to be Professor of Philosophy and Mathematics in the *Schola Illustris* at *Breda*, founded that Year by his Highness. While he lived at *Breda* he had under his Tuition *William, Lord Brereton*, who made a great Progress in Algebra under our Author. In 1652, Mr. Pell returned to *England*, and, in 1654, was sent by *Cromwell*, then *Lord Protector*, to the Protestant Cantons of *Switzerland*, where he chiefly resided at *Zurich*, with the Title of *Alegatus*; but afterwards received Orders to continue there as Resident. *June 23, 1658*, he took his Leave of the Cantons of *Switzerland* in a *Latin Oration*, and returned to *England*, which happened soon after the Death of *Cromwell*. However, his Negotiations Abroad gave a general Satisfaction, as it appeared he had done no small Service to the Interest of King *Charles II.* and the Church of *England*. *March 31, 1661*, he was ordained

ed a Deacon, and in *June* following a Priest, by Dr. Robert Sanderson, Bishop of *Lincoln*; and, the same Year, presented by Dr. Gilbert Sheldon, Bishop of *London*, to the Rectory of *Fobbing* in *Essex*; and afterward appointed one of his domestic Chaplains: And it was expected he would have been promoted to much higher Rank in the Church; but his Improvement in the Study of philosophical and mathematical Sciences were so much the Bent of his Genius, that he did not pursue his private Advantage. The Truth is, he was a shiftless Man, as to worldly Affairs, and his Tennants and Relations imposed upon him, and cozened him of the Profits of his Livings, and even kept him so indigent that he wanted Necessaries: And a little before his Death, he was cast into the *King's Bench* Prison for Debt; but was soon after released by the Benevolence of some who valued his distinguishing Talents. He was then invited, by Dr. *Whistler*, to live in the College of Physicians, where he continued for about a Year; and then was obliged, by his ill State of Health, to accept the Invitation of a Grand-child of his, at *Westminster*, but had a happy remove, by Death, *December 12, 1685*, in the 74th Year of his Age, and was interred at the Expence of Dr. *Richard Busby*, Master of *Westminster-school*, and *John Sharp*, Rector of *St. Giles's*, in the Vault called the *Rector's*.

The principal Part of his Works were as follow:

I. His *Controversia, cum Christiano Longomontano de vera Circuli Mensura*, at *Amsterdam*, 1646, 4to.

II. His *Idea of Mathematics*, *London*, 1651, 12mo.

III. A Table of 10,000 square Numbers, &c. with an Appendix concerning the Endings, or last Figures of square Numbers, *London*, 1672, Folio.

He likewise published his inaugural Oration at *Breda*. — His Demonstration of the second and tenth Books of *Euclid*. — His Alterations and Additions to *Rhombius's* Algebra, in 1688. — With many others on miscellaneous Subjects, Letters, &c. which are some of them preserved in Manuscript in the Library of the Lord *Brereton* in *Cheshire*.

*The LIFE of WILLIAM, Lord
BROUNKER.*

WILLIAM, Lord **BROUNKER**, Lord Viscount of *Castle Lyons*, of the Kingdom of *Ireland*, descended from noble Parentage, and was Grandson of Sir *Henry Brounker*, President of *Munster*, &c. born, *A. D.* 1620; the Strength of whose natural Capacity, which very early discovered itself in an Ability and Propensity for Learning, added no small Luster to the Dignity of his Birth, and his Education was suitable to both; for, being properly qualified by grammatical Learning, he was sent over, at the Age of Sixteen, to the University of *Oxford*, where he made a thorough Proficiency in the Knowledge of many difficult and useful Languages, and applied his Studies to several important Sciences. He first entered on the Study of natural Philosophy, more particularly the Nature of Man, and many metaphysical Enquiries relative thereto, and applied them to the Subject of Physic in general, in which he gave such Proofs of his Skill, that he was created Doctor of Physic in that University, *June 23, 1646*: Nor was his Genius and Studies confined to this Science, mathematical Subjects he always esteemed as meriting his assiduous Enquiries, and therefore applied himself to it with such Vigour as to make a prodigious Progress therein. And, accordingly, *July 30, 1662*, he was chosen President of the *Royal Society*, which he continued 15 Years. *November 5*, he produced his Solution of Dr. *Goddard's* third mercurial Experiment: — The 12th, he moved, that the Experiments concerning the Measure of the first Velocity of Bodies might be prosecuted, of which his Lordship was desired to be Curator. — During his Presidentship he was never backward to the Performance of any Experiments, and as vigilant in making every Improvement upon them as his Penetration and Skill would enable him; but never assuming, or forward to controul the Sentiments of others. — By his Study he likewise acquired a singular Knowledge in the municipal Laws of the Nation; for, after the Restoration, he was advanced to several Offices of Honour and Trust, appointed Chancellor of

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his Majesty's Courts, and Keeper of the Great Seal; and was one of the Lords Commissioners for executing the Office of Lord High Admiral, and Master of the Hospital of St. Catherine's near the Tower of London: But none of these diverted his Studies from the mathematical and philosophical Sciences. Mr. Wood tells us, that he greatly promoted the Interest and Reputation of that Society, by his Learning and Experience. He made several Improvements in the Art of Gunnery, which he illustrated by Experiments, particularly of the recoiling of Guns, which were afterwards published by Dr. Thomas Sprat, in his *History of the Royal Society*. — He wrote several Letters to Dr. James Usher, Archbishop of Armagh; and likewise maintained a Correspondence with Dr. John Wallis on mathematical Subjects, published in his *Commercium Epistolicum*. He likewise wrote a Piece upon the squaring the Hyperbola, which was the 1st Treatise on that Subject, published in the *Philosophical Transactions*, Number 134. He died at his House in St. James's Street, Westminster, April 5, 1684, aged 64 Years, and was interred on the 14th of the same Month, in a Vault in the Choir, belonging to the Hospital above-mentioned.

The LIFE of CHRISTIAN HUYGENS.

CHRISTIAN HUYGENS, a very great Mathematician and Astronomer, was born at the Hague in Holland, April 14, 1629, and was Son of Constantine Huygens, Lord of Zulichem, who had served three successive Princes of Orange in the Quality of Secretary. He spent the greatest Part of his Life in cultivating the Mathematics, and not in the speculative Part only, but in making this Science subservient to the Purposes of Life: He had made no inconsiderable Progress therein even at nine Years of Age, as he had also in Music, Arithmetic, and Geography; in all which he was, with much Care and Pains, instructed by his Father, who, all the while, did not suffer him to neglect the *Belles Lettres*. — At thirteen Years of Age, he was put upon the Study of Méchanics; for he had discovered

The Life of CHRISTIAN HUYGENS. 339

a wonderful Curiosity that Way, in examining Machines, and the like; and, two Years after, had the Assistance of a Master in Mathematics, under whom he made a surprizing Progress. In the Year 1645, he went to study *Law* in the University of *Leyden*, under the learned Civilian *Vinnius*; yet did not attach himself so closely to this Study, but he found Time to continue his mathematical Studies under that famous Professor *Van Schooten*. He left this University at the End of one Year, and went to *Breda*, where an University had just been founded, and put under the Direction of his Father: And here he made the *Law* his chief Study, for 2 or 3 Years. But in the Year 1651, he gave the World a Specimen of his Genius for Mathematics, by a *Latin* Treatise on that Science. — After his Return to the *Hague*, in 1649, he went to *Holstein* in *Denmark*, in the Retinue of *Henry*, Count of *Nassau*, and was extremely desirous of going to *Sweden* in order to see *Des Cartes*; but the short Stay of the Count in *Denmark* would not permit him. In the Year 1655, he travelled into *France*, and took the Degree of Doctor of *Law* at *Angers*. In 1658, he published his *Horologium Oscillatorium* at the *Hague*. — He had exhibited, in a preceding Work, the Model of a new invented Pendulum; but, as some Persons, envious of his Reputation, were labouring to deprive him of the Honour of the Invention, he wrote this Book to explain the Construction of it, and to shew, that it was very different from the Pendulum of Astronomers, invented by *Galileo*: And as *Galileo* had endeavoured to explain some of the surprizing Appearances of the Planet *Saturn*, and having observed two Stars which attended it, and afterwards amazed to find them disappear, *Christian Huygens*, being extremely desirous to account for these Changes, laboured with his Brother *Constantine* to bring the Telescopes to greater Perfection, and made himself Glasses by which he could view Objects at a greater Distance than any that had been yet contrived. With these he applied himself to observe all the Places and Appearances of *Saturn*, and drew a Journal of all the different, and very varying Aspects of that Planet. He discovered a Satellite attending it; for none of the Five were then known: And, after a long Course of Observation, perceived that the Planet was surrounded with a solid and permanent Ring, which never changes its Situation.

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These new Discoveries advanced him to great Esteem amongst the Astronomers of his Time.

In the Year 1660, he took a second Journey into *France*, and, the Year after, passed over into *England*, where he communicated his Art of polishing Glasses for Telescopes, and was made *Fellow of the Royal Society*.

About this Time, the Air-pump was invented, which received considerable Improvements from him: ——— This Year also, he discovered the Laws of the Collision of elastic Bodies, as did, afterwards, our own Countrymen and celebrated Mathematicians, *Wallis* and *Wren*, with whom *Huygens* had a Dispute about the Honour of this Discovery. ——— After some Months Stay in *England*, he returned to *France* again, in 1663, where his Merit became so conspicuous, that *Monsieur Colbert* resolved to fix him at *Paris*, by settling a considerable Pension on him: Accordingly, in 1665, Letters were sent to him to the *Hague*, whither he was returned, written in the King's Name, to invite him to *Paris*, with the Promise of a large Stipend, and other considerable Advantages. *Huygens* consented to the Proposal, and retired to *Paris*, from thence, to the Year 1681, he resided there, where he was made a Member of the *Royal Academy of Sciences*: And all this Time was spent in mathematical Pursuits. He wrote several Works which were published from Time to Time, and invented, and perfected several useful Instruments and Machines: But continual Application began then to impair his Health, and though he had gone for the Benefit of his native Air twice, viz. in 1670 and 1675, for the same Purpose, he was now obliged to betake himself to it altogether: Accordingly, he left *Paris*, with all the Emoluments of Royal Favour; yet resolved to employ the Remainder of his Life in those arduous and useful Studies, which was continued to him till the 8th of June, 1695, when he died in the 67th Year of his Age, while his *Cosmotheoros*, or *Latin Treatise*, concerning a Plurality of Worlds, was printing. However, he provided in his Will for its Publication, and entrusted it to his Brother *Constantine*: But his Engagements at Court were so great, that it retarded the Publication, and he died before it was quite finished, which was in 1698. Mr. *Huygens* had left, by Will, to the University of *Leyden*, his mathematical Writings, and requested Mess. *de Volder* and *Ful-*

Willebrordus, the former Professor of Natural Philosophy and Mathematics at *Leyden*, and the other at *Franecker*, to examine his Works, and publish what they should think proper: and this they prosecuted in a considerable Degree in a Volume published, intitled, *Opuscula Posthuma quæ Continent Dioptricam, Commentarios de vitris figurandis, Dissertationem de Corona et Parbeliis, Tractatum de motu et de vi centrifuga, Descriptionem, Automati Planetarii*. Mr. *Huygens* has also written, in *Low-Dutch*, the second of the Tracts it contains, relating to the Art of forming and polishing Telescope Glasses, to which he had greatly applied himself: But Dr. *Boerhaave*, Professor of Physic at *Leyden*, had taken the Pains to translate it into *Latin*. In the Year 1704, were published, in Quarto, his *Opera Varia*. This Collection is generally bound in 4 Volumes; the 1st contains, his Pieces of Mechanics. The 2d, those relating to Geometry. The 3d, those on Astronomy. The 4th, Miscellaneous Tracts. Mr. *Gravesande* had the Care of this Edition, in which he has inserted several Additions to the Pieces contained in it, extracted from Mr. *Huygen's* Manuscripts. In the Year 1728, were printed, in two Volumes in Quarto, at *Amsterdam*, his *Opera Reliqua*: which new Collection was published also by Mr. *Gravesande*. The 1st Tome contains his Treatises of *Light* and *Gravity*: the 2d, his *Opuscula Posthuma*; which had been printed in the Year 1703. — In Justice to this illustrious Author it must be observed, that his *DIOPTRICS* is fraught with the most valuable Discoveries in the Construction and Theory of optical Instruments; and that his *Automaton*, or *Planetarium* is the most compleat and artful Invention, as well as the Original of all that have since been made: In such curious and useful Researches was Mr. *Huygens's* whole Life spent: He loved a quiet studious Life, and this, perhaps, had the Ascendant so far as to keep him in a single State, tho' he was chearful in his Temper, an amiable and worthy Man, and all that knew him will do him the Honour, to say, that *he was as good as he was great*.

The LIFE of ISAAC BARROW.

ISAAC BARROW, an eminent Mathematician and Divine, descended from an antient Family of that Name in *Suffolk*: His Father, Mr. *Thomas Barrow*, was a reputable Citizen in *London*: and his Mother, *Anne*, Daughter of *William Buggin*, of *North-Cray* in *Kent* Esq; He was born in *London* in *October*, 1630, and, as his Father very early designed him for a Scholar, he was placed in the *Charter-House-School* for the first 2 or 3 Years: Thence removed to *Felstead* School in *Essex*, where he quickly made such a Progress in Learning, that his Master appointed him a Tutor to the Lord Viscount *Fairfax* of *Emely* in *Ireland*, who was then his Scholar, during his Stay at *Felstead*: he was admitted, *December* 15, 1643, being then fourteen Years of Age, a Pensioner of *Peter-House* in *Cambridge*, under his Uncle Mr. *Isaac Barrow*, then Fellow of that College: When he was qualified for the University, he was entered a Pensioner in *Trinity College*, the 5th of *February* 1645; in 1647, he was chosen a Scholar of the House; and tho' he always continued a staunch Royalist, yet, by his Merit and prudent Behaviour, he preserved the Respect and Commendation of his Superiors. He applied himself, with great Diligence, to the Study of all Parts of Literature, especially Natural Philosophy; and tho' he was yet but a young Scholar, his Judgment was too great to rest satisfied with the shallow and superficial Philosophy then taught in the Schools: he applied himself, therefore, to the reading and considering the Writings of the Lord *Verulam*, *Galileo*, &c. who seemed to offer something more solid and substantial. In 1648, Mr. *Barrow* took the Degree of Bachelor of Arts: The Year following, he was elected Fellow of his College, meerly out of Regard to his Merit; for he had no Friends to recommend him, being of the opposite Party: And as he found the Times not favourable to Men of his Opinion in Church and State, he turned his Thoughts to the Profession of Physic, and made a considerable Progress in the Knowledge of Anatomy, Botany, and Chemistry: But afterward, upon more mature Deliberation, and with the Advice of his Uncle, he

he applied himself to the Study of Divinity, to which he was in some Measure obliged by his Oath on his Admission to Fellowship. But, by reading *Scaliger* on *Eusebius*, he perceived the Dependance of Chronology on Astronomy, which put him upon reading *Ptolomy's Almagest*; and finding that Book and all Astronomy to depend on Geometry, he made himself Master of *Euclid's Elements*, and from thence proceeded to consult the Writings of many other antient Mathematicians. He likewise made a short Essay towards acquiring the *Arabic* Language, but made no great Proficiency therein, his Genius and Disposition for Poetry diverting him from those several Speculations. In 1652, he commenced Master of Arts, and on the 12th of *June*, in the following Year, was incorporated into that Degree at *Oxford*: And when Dr. *Duport* resigned the Chair of *Greek* Professor, he recommended his Pupil, Mr. *Barrow*, to succeed him: who justified his Tutor's Opinion of him by an excellent Performance of the *Probation Exercise*: But being looked upon to favour *Arminianism*, another was preferred; which Disappointment, as it arose from that Source, helped to determine him in his Resolution of travelling Abroad: Accordingly, in the Year 1655, he went into *France*, leaving behind him most of his Books.

The same Year, after his Stay in *France* a few Months, and transmitting some Observations he had made to his Friends, he went into *Italy*, and stayed some Time at *Florence*, where he had the Advantage of perusing several Books in the great Duke's Library, and of conversing with Mr. *Filton*, his Librarian. He then purposed to visit *Rome*, but, the Plague then raging in that City, he took Ship at *Leghorn*, November 6, 1656, for *Smyrna*: In this Voyage, they were attacked by a Corsair of *Algiers*, who, perceiving the stout Defence the Ship made, sheered off and left them. And upon this Occasion, Mr. *Barrow* gave a remarkable Instance of his natural Courage and Intrepidity. At *Smyrna* he was most heartily received by the *British Consul*, Mr. *Bretton*, upon whose Death he wrote an Elegy to the *English* Factory. From thence he proceeded to *Constantinople*, where he met with a friendly Reception from Sir *Thomas Brandish*, the *English* Ambassador. This Voyage from *Leghorn* to *Constantinople* he has described in a *Latin* Poem. At *Constantinople* he read over the Works of St. *Chrysostom*, once Bishop of that See, whom he pre-

preferred to all the other Fathers. Having stayed in *Turkey* about a Year, he returned from thence to *Venice*, from whence he came home in 1659, thro' *Germany* and *Holland*, and has left a Description of some Parts of those Countries in his Poems. Soon after Mr. *Barrow* returned to *England*, he was episcopally ordained by Bishop *Brownrig*, notwithstanding the unsettled State of the Times, and the declining Condition of the Church of *England*. Upon King *Charles* the second's Restoration, his Friends expected he would have been immediately preferred, on Account of his having suffered, and deserved so much; but it came to nothing, which made him wittingly say,

*Thy Restoration, Royal Charles, I see,
By none more wish'd, by none less felt, than me.*

However, he wrote an Ode upon that Occasion, in which he introduces *Britannia* congratulating the King upon his Return. In 1660, he was chosen *Greek* Professor of the University of *Cambridge*: His Oration, spoken upon that Occasion, is preserved among his *Opuscula*. When he entered upon this Province, he designed to have read upon the *Tragedies* of *Sophocles*, but, altering his Intention, he made Choice of *Aristotle's Rhetoric*. The Year following, which was 1661, he took the Degree of Bachelor in Divinity: and in July 1662, he was elected Professor of Geometry in *Gresham College*: in this Station, he not only discharged his own Duty, but supplied likewise the Absence of Dr. *Pope*, the Astronomy Professor. Among his Lectures, some were upon the Projection of the Sphere, which are lost; but his *Latin* Oration, previous to his Lectures, is still extant. The same Year, he wrote an *Epithalamium* on the Marriage of K. *Charles* and Q. *Catherine*, in *Greek* Verse. About this Time Mr. *Barrow* was offered a good Living; but the Condition annexed, of teaching the Patron's Son, made him refuse it, as thinking it too like a simoniacal Contract. Upon the 20th of May, 1663, he was elected Fellow of the *Royal Society*. In the same Year, Mr. *Lucas* having founded a Mathematical Lecture at *Cambridge*, Mr. *Barrow* was so powerfully recommended by Dr. *Wilkins* to that Gentleman's Executors, that he was appointed the first Professor; and, the better to secure the End of so noble

able and useful a Foundation, he took Care that himself and his Successors should be obliged to leave, yearly, to the University, ten written Lectures. We have still extant, his *Prefatory Oration*, spoken in the public mathematical School, *March 14, 1664*: But tho' his two Professorships were not Inconsistent, he chose to resign that of *Gresham College*, which he accordingly did *May 20, 1664*. He had likewise been invited to take Charge of the *Cottonian Library*; but, after some Consideration, he declined it, and resolved to settle in the University. In 1669, he also resigned the mathematical Chair to his very worthy Friend and learned Successor Mr. *Isaac Newton*, being determined to quit the Study of the Mathematics for that of Divinity. He was Fellow of *Trinity College* when he was collated by his Uncle the Bishop of *St. Asaph*, to a small *Sine Cure* in *Wales*; and by Dr. *Seth Ward* to a Prebend in that Cathedral; the Profits of both which he applied to charitable Uses, and afterward resigned, when he became Master of his College. This Year, 1670, he was created Doctor in Divinity, by Mandate. In 1672, Dr. *Pearson*, Master of *Trinity College*, on the Death of Bishop *Wilkins*, being translated to the Bishopric of *Chester*, Dr. *Barrow* was appointed to succeed him, by the King's Patent, 1673: And his Majesty was pleased to say, upon that Occasion, he had given it to the best Scholar in *England*. He gave the highest Satisfaction to that Society, whose Interest he constantly and carefully consulted. In 1675, he was chosen Vice-chancellor of the University: In the mean Time, he abated nothing of his Studies in order to increase his Stock of Sermons, and to finish his Treatise of the Pope's Supremacy: He understood Popery well, as militant in *England*, triumphant in *Italy*, disguised in *France*, and would have been forwardest in suppressing the Progress of it: But this great and learned Divine and Mathematician died of a Fever the 4th of *May, 1677*, and was buried in *Westminster-abbey*, where a Monument was erected to him by a Subscription of his Friends; his Epitaph was written in *Latin*, by his dear Friend Dr. *Mapletoft*. In *English* thus:

“ *Isaac Barrow*, Doctor in Divinity, and Chaplain in Ordinary to King *Charles II.* a God-like and truly good Man; if Piety, Probity, Fidelity, the most extensive Learning, and no less Modesty, together with most holy and sweet Manners

“ can confer that Title. He was Professor of Geometry in
 “ *Gresham College, London*, and of the *Greek Tongue* and
 “ *Mathematics at Cambridge*; an Ornament to all his Chairs,
 “ to the Church, and to the Nation, he added Lustre to *Tri-*
 “ *nity College*, as Master, and improved it by laying the Foun-
 “ dation of a truly Royal Library: Riches, Honours; and what-
 “ ever Men eagerly pursue, he did not despise, but neglect, as
 “ being born to greater and more noble Views: To glorify God
 “ was his principal Aim, and to imitate him by doing Good to
 “ all Men, even Posterity witnesseth: To whom, being dead,
 “ he yet preacheth. The rest, and even greater Things than
 “ these may be found in his Writings. Go, Reader, and
 “ imitate him. He died the 4th of *May*, 1677, in the 47th
 “ Year of his Age.” — Many others have attempt-
 ed to do Justice to his Conduct and Behaviour, as the most
 Amiable imaginable, always ready to communicate Knowledge;
 as free and open in his Conversation, in which he generally
 spoke to the Importance, as well as Truth of any Question pro-
 posed; facetious in his Talk upon fit Occasions, and skillful to
 accommodate his Discourse to different Capacities; indefatiga-
 ble in various Studies; of clear Judgment on all Arguments,
 and steady Virtue under all Difficulties; of a calm Temper in
 factious Times, and of large Charity in midling Circumstances;
 easy and contented in his Station, and, with the same Decency
 and Moderation, maintained his Character under the Tempta-
 tions of Prosperity: In short, he was the greatest Scholar of his
 Time; and he was highly esteemed, as having shewn a Com-
 pass of Invention equal, if not superior to any of the Moderns,
Sir Isaac Newton only excepted. — His Works were prin-
 cipally,

I. *Euclidis Elementa. Cantab.* published in *October* 1655.

II. *Euclidis Data. Cantab.* in *October* 1657.

III. *Lectiones Opticæ XVIII*, 1669, 4to.

IV. *Lectiones Geometricæ XIII*, *Lond.* 1670, 4to

V. *Archimedis Opera, Appollonii Conicorum Libri IV. Theodosii Sphericorum Lib. III. nova Methodo Illustrata, et Succincte Demon-*
strata. Lond. 1675, which were published in his Life-time:
 Besides three other Volumes on mathematical and astronomical
 Subjects, in *Latin*, which were published after his Decease.

The Life of JOHN BAPTISTE, &c. 347

All his Works, which he wrote in *English*, were published in three Volumes Folio, by Dr. *John Tillotson*, Lond. 1683.

Dr. *Barrow* has left also many other curious Papers, on mathematical Subjects, written in his own Hand, which were communicated by Mr. *Jones*, to Mr. *Ward*, the Author of the *Lives of the Gresham Professors*: Where the Reader may see a more particular Detail of his Works.

The LIFE of JOHN BAPTISTE DU HAMEL.

JOHAN BAPTISTE DU HAMEL, was an eminent French Mathematician and Divine, descended from a reputable Family in lower *Normandy*. Historians have only mentioned that he was born in the Year 1624. He passed through his first Studies at *Caen*, and his Course of Rhetoric and Philosophy at *Paris*, and gave the greatest Proof of an uncommon Genius in his early Years. — At the Age of eighteen Years, he had made a surprizing Progress in the Knowledge of astronomical and mathematical Sciences, when he published his first Production, in which he explained, in a very easy and intelligible Manner, *Theodosius's* three Books upon Spherics, illustrated by 2 or 3 simple Figures: To which he added, a Treatise of Trigonometry, extremely short, yet perspicuous, and designed it as an Introduction to Astronomy. In one of his latter Works he mentions this Book, as an Instance of his Vanity in his younger Years: But, as *Fontenelle* remarks, there are few Persons of that Age capable of given such an Instance of Vanity. At nineteen Years of Age, he entered himself into the Congregation of the Oratory, where he continued ten Years, and left it in order to be Curate of *Neuilli* upon the *Marne*: He nevertheless applied himself intensely to Study, and distinguished himself greatly by publishing Works upon Astronomy and Philosophy. In 1666, *Monsieur* proposed to *Lewis XIV.* a Scheme for establishing a Royal Academy of Sciences, which his Majesty

jeſty approved of, and appointed our Author Secretary of it. — In 1668, he attended *Monſieur Colbert de Croiſſy*, Plenipotentiary for the Peace of *Aix la Chapelle*, and, upon the Concluſion of it, accompanied him in his Embaſſy to *England*, where he formed an Acquaintance with the moſt eminent Perſons in this Nation in theſe Sciences, particularly *Boyle*, *Ray*, *Willis*, &c. &c. From hence he went over to *Holland* in order to enlarge his Acquaintance; and advance himſelf in theſe Sciences. In this Tour, he acknowledges to have made many uſeful Obſervations; and to have laid a Foundation for improving his future Studies. — In 1678, his *Philosophia Vetuſ & Nova, ad uſum Scholæ accommodata in regia Burgundia Pertractata*, was printed at *Paris*, containing a judicious Collection of the antient and modern Opinions in Philoſophy, &c. His Works in this Way now became very numerous, which were collected and printed at *Nuremberg* in 1681, under the Title of *Opera Philoſophica et Aſtronomica*; and were highly valued at that Time. He afterwards publiſhed an Account of the Foundation of the Royal Academy of Sciences, and its Tranſactions, from 1666 to 1700, and is now the moſt eſteemed of any of his Works relating to Philoſophy. — He likewiſe publiſhed many Pieces on theological Subjects: The laſt and moſt approved was printed at *Paris* in 1706, in Folio; intituled, *Biblia Sacra Vulgatæ Editionis*, &c.

He died at *Paris* on the 6th of *Auguſt*, 1706, through the Decline of Age, being almoſt 83 Years old. He had quitted his Cure at *Neuille* in 1663, yet he went every Year to viſit his old Flock, and the Day he ſpent there was ſpent as an *Holy Day* by the whole Village. He was highly eſteemed by the moſt eminent Prelates of *France*, though he enjoyed but very ſmall Preferments. He was *Regius* Profeſſor of Philoſophy, in which he was ſucceeded by *Monſieur Varignon*. He was a Man of great Modeſty, Affability, Piety, and Integrity: He was averſe to all Conteſts, and exempt from Jealouſy and Affectation. His Knowledge in the *Latin* Tongue was ſuperior to moſt, in which Language he principally wrote his Lucubrations with great Purity and Elegance: So that his Character is venerated by the Lovers of Science and Literature.

The LIFE of JAMES GREGORY.

JAMES GREGORY, an eminent Mathematician, was born at *Aberdeen* in 1639, and, being educated in that University, made great Proficiency in classical Learning, but took the greatest Pleasure in philosophical Researches, and, for that Reason, he made the Writings of *Kepler*, *Descartes*, and other Authors, (who had distinguished themselves by their mathematical Works) his principal Study, and began early to make Improvements upon their Discoveries in Optics. — The first of these Improvements was, the Invention of the Reflecting Telescope, which still bears his Name, and, which was so happy a Thought, that it has given Occasion to the most considerable Improvements made in Optics since the Invention of the Telescope. — He published the Construction of this Instrument in 1663, at the Age of 24, and coming next Year to *London*, he became acquainted with Mr. *Collins*, and endeavoured to perfect his Scheme by proper Glasses; but, as he could not succeed for want of a proper Artist to grind a plate of Metal for the Object Speculum into a true parabolic Concave, which the Design required, he was much discouraged thereby, that he suspended his Design 'till he had prosecuted his intended Tour of *Italy*, which was then esteemed the Mart of mathematical Learning. — He had not been long abroad, when the same inventive Genius, which had before shewed itself in practical Mathematics, carried him to some new Improvements in the speculative Part. — The sublime Geometry on the Doctrine of Curves, and the Doctrine of squaring the Circle, were but in its infant State, when our Author discovered a new analytical Method of summing up an infinite converging Series, whereby the Area of the Hyperbola, as well as the Circle, may be computed to any Degree of Exactness. He was then at *Padua*, and getting a few Copies of his Invention printed there, in 1667, he sent one to his Friend Mr. *Collins*, who communicated it to the *Royal Society*, where it met with the Commendation of Lord *Brouncker* and Dr. *Wallis*. Our Author reprinted it at *Venice*, and published it in the Year 1668,

together with another Piece, wherein he first of any one entertained the Public with a Method for the Transformation of Curves: An Account of this Piece was also read by Mr. *Collins* before the *Royal Society*, of which Mr. *Gregory*, on his Return, was chosen a Member, Jan. 14th. He then communicated an Account of the Controversy he had had in *Italy* about the Motion of the Earth, which was denied by the most celebrated Astronomers in that Country. ——— The same Year his Quadrature of the Circle being attacked by the celebrated Mr. *Huygens*, a pretty warm Controversy arose: Mr. *Gregory's* Defence was published in the *Philosophical Transactions*, N^o. XLIV. for Feb. 1669. ——— This Controversy (as too often happens) was managed with too great Warmth, which might probably terminate the sooner, and afford less Satisfaction to the Readers.

It likewise happened about this time, that Mr. *Gregory* received a Letter from Mr. *Collins*, of the Series invented by Sir *Isaac Newton*, who, therein, had accurately effected that which our Author was stiffly contending against Mr. *Huygens* to be utterly impossible: that is, the *Ratio* of the Diameter of a Circle to the Circumference expressed in a Series of simple Terms independent of each other, and entirely freed from the magic Vinculum of Surds, in which they had, 'till then, been indissolubly held.

But tho' our Author had not the better in this Dispute, he was, on many Accounts, in high Esteem with the *Royal Academy* at *Paris*: that, in the Beginning of the Year 1671, it was resolved by that Academy to recommend him to their Grand Monarch, for a Pension; and the Design was approved even by Mr. *Huygens*, his Antagonist, and a Petition was presented, but without Success.

In 1672, Sir *Isaac Newton*, from his wonderful Discoveries in the Nature of Light, having contrived a new reflecting Telescope, and made several Objections to Mr. *Gregory's*, this gave Birth to a Dispute between those two great Philosophers, which was carried on this, and the following Year, in the most amicable Manner on each Side: Mr. *Gregory* defending his own Construction so far, as to give his Antagonist the whole Honour of having made the catoptric Telescopes preferable to the Dioptric, on Account of his having discovered, that the Imperfections
in

in these Instruments were not so much owing to a Defect in the Object Speculum, as to the different Refrangibility of the Rays of Light. — In the Course of this Dispute, our Author described a burning Concave Mirrour, which was approved by Sir *Isaac*, and is still in good Esteem. — All this while he attended the proper Business of his Professorship with great Diligence, which led him to farther Improvements in the Invention of infinite Series, which he occasionally communicated to his intimate Friend and Correspondent Mr. *Collins*, who might have had the Pleasure of receiving many more, had not our Professor's Life been cut short by a Fever, in *Dec.* 1675, at the Age of 36 Years.

He possessed one, and that the most distinguishing as well as the most amiable *Quality*, or Disposition, in the Character of a true Philosopher: He was content with his Fortune in his Professorship, very moderate, and without any anxious Ambition for more; resolved to make that agreeable, by giving a Relish to such Enjoyments as were within his Reach: A pleasant Instance of which we have in a small Treatise, published by him, in 1672, entitled, *The great Art of weighing Vanity*.

But the most shining Part of Mr. *Gregory's* Character is, that of his mathematical Genius as an Inventor; in this View, particularly, he merits a place in these Memoirs: For, besides those Inventions we have already mentioned, he was the first of any who gave a geometrical Demonstration of Lord *Brouncker's* Series for squaring the Hyperbola, as it had been explained by *Mercator* in his *Logarithmotechnia*. He was likewise the first who demonstrated the meridian Line to be analagous to a Scale of Logarithmic Tangents of the half Compliment of Latitude; of great Use in Navigation. — He also invented, and demonstrated geometrically, by the Help of the Hyperbola, a very swift converging Series for making the Logarithms: and therefore recommended by Dr. *Halley* as very proper for Practice. — He also sent to Mr. *Collins* the Solution of the famous *Keplerian* Problem by an infinite Series. — He found out a Method of drawing Tangents to Curves geometrically, without any previous Calculations. — He gave a Rule for the direct and inverse Method of Tangents, which stand upon the same Principle (of Exhaustions) with that of Fluxions, and differs not much from it in the Manner of Application. — He

— He likewise gave a Series for the Length of the Arc of a Circle from the Tangent; and *Vice Versa*. These, with others for certifying or measuring the Length of the elliptic and hyperbolic Curves, were sent to Mr. *Collins*, in Return for some received from him of Sir *Isaac Newton*'s; and their Elegancy being admirable, and above whatever he had produced before, and after the Manner of Sir *Isaac Newton*, plainly indicated he had improved himself greatly by that Master, whose Example he followed in delivering his Series in simple Terms, independent on each other. We are assured, that, at his Death, he was preparing a general Method of Quadrature, by infinite Series, like that of Sir *Isaac*. This appeared by his Papers, which came into the Hands of his Nephew, Dr. *David Gregory*, who published several of them: And he himself assured Mr. *Collins*, he had found out the Method of making Sir *Isaac*'s Series. This being the Study he followed with the greatest Application, he enjoyed the Pleasure of seeing the Propriety and Excellency of what had been first investigated, and discovered by others, and of making some farther Progress on the Strength of his own Genius.

The following are the principal Works published by Mr. *Gregory*, which contain the chief of his Inventions.

1. *Optica Promota*, which includes the Construction of his Telescope. And besides the principal Problems in Optics contained in 59 Propositions, he added an Appendix of 30 others on the Theory and most useful Parts of practical Astronomy. Printed in 1683, in 4to.

2. His *Vera circuli, & Hyperbolæ Quadratura*: Containing, his Method of transforming Curves. Printed at *Padua* in 1667, 4to. of which a more correct Copy was printed the Year following.

The rest of his Inventions make the Subject of several Letters and Papers, printed either in the *Philosophical Transactions*: The *Commerc. Epistolæ Joh. Collins & Alior*, 1715, 8vo. and in the Appendix to the *English Edition* of Dr. *David Gregory*'s *Elements of Optics*, 1735, 8vo. by Dr. *Desaguliers*.

The LIFE of JAMES OZANAM.

JAMES OZANAM, an eminent Mathematician, was born in the *Sovereignty of Dombes in France*, in 1640; his Father was in affluent Circumstances, possessed of Fortune sufficient to encourage the Genius, and promote the Happiness of his Children: He was of *Jewish* Extraction, but embraced the Christian Religion, from Conviction, and was likewise distinguished by several Offices, which he held in the Parliaments of *Provence*. Our Author was the youngest Son, and, by the Laws of that Country, the principal Part of the Estate devolved to the Eldest: But this proved an Incitement to the Father, to bestow on him a liberal Education: His View was, indeed, to qualify him for some dignified Station in the Church, that he might enjoy some Advantages from his great Interest: But when our Author had made a considerable Proficiency in Learning, he found no Disposition for the Ecclesiastical State; and some mathematical Books opportunely falling into his Hands, he was so inspired with a Love of that Science, that, though he had no Master to instruct him, he made considerable Progress in that Study, and wrote a Piece in Mathematics before he advanced to the Age of twenty Years. He nevertheless continued the Study of Divinity, in Obedience to his Father's Inclination, for about four Years; but upon his Father's Decease, he intirely quitted that Science, and betook himself wholly to the Mathematics. He afterwards went to *Lyons*, where he taught the several Branches of that Science, with great Applause, but to no great Advantage: He acknowledged, that about this Time he was seduced to an unreasonable Passion for Gaming, which however did not proceed from avaricious Principles; for, upon many Occasions, he was remarkable for Generosity of Temper, which very remarkably turned to his Advantage in the following peculiar Instance: Two Foreigners, to whom he taught Mathematics at *Lyons*, having expressed some Uneasiness at being disappointed of some Bills of Exchange, in order to go to *Paris*, he asked them, what Money they wanted? And being told fifty Pistoles,

he lent them the Sum immediately, without accepting a Note. These Foreigners, when they came to *Paris*, gave an Account of this to Mons. *Dagueffcau*, Father of the Chancellor. That Magistrate, being touched with a Sense of so generous an Action, engag'd them to send for Mr. *Ozanam* to *Paris*, with a Promise that he would assist him to the utmost of his Power: He was thereupon invited, and prevailed on to accept it; and he soon after undertook the Journey, in which some Incidents occurred no less favourable to him than entertaining: For upon the Road to *Paris*, it is said, he accidentally met with a Gentleman who discovered this favourite Passion, and then remonstrated on the Unsuitableness of it to a Person of his Character, and, withal, assured him of the Advantages he might reasonably hope to enjoy, if he would entirely lay aside the Practice: He assured him that, as he was then going to *Paris*, accomplished as he was, he might soon raise his Reputation and his Fortune, and marry, at 35 Years of Age, honourably and happily, if he would renounce Gaming, which, with some other Particulars, were verified in the Event. ——— He was scarce arrived at *Paris*, where he was received with great Marks of Esteem, when his Mother, falling sick, sent for him to come to see her: Upon which he hastened, but she died before an Interview, and his eldest Brother had taken Care to secure to himself all the Estate and Effects. Our Author returned therefore to *Paris*, breaking off a Correspondence with his Family, from whom he enjoyed nothing but a Name. However, the Gentleman's Advice had made no small Impression on him, and he abandoned his Inclination for Gaming, and devoted himself entirely to the Mathematics. ——— He was young, handsome, and sprightly; and this exposed him to some Affairs of Gallantry; and it appears, that his Virtue was under no small Temptation and Trial by a Person who resided near him: But, with a manly Resolution, he guarded against the Snare, and accordingly he resolved to marry a Lady, who had inspired him with a Passion for her by her good Nature, Modesty, and Virtue; and he was not deceived in these Appearances, for he married her, had twelve Children by her, most of whom died young: He continued afterward to reside at *Paris*, and taught the several Branches of the

the Mathematics, which produced a considerable Income, was highly esteemed by Persons of Character and Literature, and enjoyed perhaps an uncommon Degree of domestic Happiness: But, subject to the Vicissitudes of Life, in the Year 1701, and at the Age of 61, he lost his Wife, and with her all his darling Satisfaction, and this reduced him to a very melancholy State. At this Time, in regard to his Merit, and probably to divert his melancholy, he was chosen in Quality of *Eleve* to the *Royal Academy of Sciences*, and was solicited to take under his Care and Tuition, two young Noblemen of the first Rank; but this latter he refused, from the strong Apprehensions he had of dying soon, though he was not then ill: And it is said, he languished till he died without any Sickness, *April 3, 1717*, in the 77th Year of his Age, after having devoted his Life, the Prime or principal Part thereof, to the Study of those Sciences, in which the great Improvements he made, and his successful and extensive Propagation of that Knowledge, is abundantly evident from his Works. — He knew too much of Astronomy to give into judicial Astrology, which some of his Contemporaries were extremely fond of, and which he exploded on all proper Occasions. He was of a chearful Temper amidst his greatest Distresses, of a generous Disposition, great Simplicity of Manners, irreproachable in his Conduct to others, and of strict exemplary Devotion; but he never assumed to know more of Religion than other People. — He used to say, “ that it was the Business of
“ the Doctors of the *Sorbonne* to dispute, of the Pope to de-
“ cide, and of a Mathematician to go to Heaven in a strait
“ Line.”

His Writings are as follow:

- I. A Treatise of practical Geometry.
- II. A Canon of natural and logarithmic Sines, Tangents, and Secants.
- III. A Treatise of Lines of the first Order, the Construction of Equations, &c.
- IV. The Use of the Compasses of Proportion explained and demonstrated.
- V. An universal Instrument for readily resolving geometrical Problems without Calculation.

VI. A

356 BIOGRAPHIA PHILOSOPHICA.

- VI. A mathematical Dictionary.
 - VII. A general Method for drawing Maps and Charts, upon all Sorts of Planes.
 - VIII. A Course of the Mathematics, in 5 Vol. Octavo.
 - IX. A Treatise of antient and modern Fortification.
 - X. Mathematical and philosophical Recreations, in 4 Vol. Octavo.
 - XI. A new Treatise of Trigonometry.
 - XII. An easy Method for measuring all Sorts of Superficies, &c. for the Use of Mechanics.
 - XIII. New Elements of Algebra, Octavo.
 - XIV. *Euclid's Elements*, by *P. De Chales*, corrected and enlarged.
 - XV. *Boulanger's* practical Geometry enlarged.
 - XVI. *Boulanger's* Treatise of the Sphere, corrected and enlarged.
 - XVII. The Theory and Practice of Perspective.
 - XVIII. A Treatise of Cosmography and Geometry: Besides several Tracts published in the *Journal des Scavans*, and in the *Memoirs des Trevoux*.
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The LIFE of PHILIP DE LA HIRE.

PHILIP *de la HIRE*, an eminent *French* Mathematician and Astronomer, was born at *Paris* on the 18th of *March*, 1640: His Father, *Laurence de la Hire*, who was Painter in Ordinary to the King, and Professor in the Academy of Painting and Sculpture, intended him for the same Profession; and with that View had him instructed in the Principles of Design, and such Branches of Mathematics, as related thereto, but died when *Philip* was no more than seventeen Years of Age. Our Author, soon after falling under an Indisposition of Body, projected a Journey into *Italy*, both for the Recovery of his Health and for his Improvement in Arts and Sciences; and he was not deceived in his Expectations, for he acquired both a
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Knowledge of those curious Antiquities with which *Italy* every where abounds, and yet made great Proficiency in the Science of Geometry, which he even preferred to Painting, to which he devoted himself with great Affiduity: And after about four Years Absence, on his Mother's Importunity, he returned again to *Paris*, where he renewed his mathematical Studies with the utmost Intenseness, and published several Works, which gained him such high Reputation, that he was made a Member of the *Academy of Sciences*. In 1678, Monsieur *Colbert* having formed a Design of procuring a better Chart, or Map of the Kingdom, than any which had hitherto been taken, Monsieur *de la Hire* was nominated, with Monsieur *Picard*, to make the necessary Observations for that Purpose. He went to *Bretagne* in 1679, to *Guyenne* in 1680, to *Calais* and *Denmark* in 1681, and to *Provence* in 1682: Yet, in these Preregrinations, did not confine his Attention to the main Object of them; but philosophised upon every Thing that occurred, and particularly made Observations on the Variations of the magnetic Needle; — upon Refractions; — and upon the Height of Mountains as determined by the Barometer.

In 1683, he was employed in continuing the famous Meridian Line, which Monsieur *Picard* had began in 1669: Our Author continued it to the North Boundary of *Paris*, while Mr. *Cassini* continued it to the South: But that great Minister, *Colbert*, dying, the Work was not fully compleated.

He was then employed in taking the necessary Surveys, for those grand Levels which *Lewis XIV.* had projected, which was soon after executed.

Geometry, however, did not engross all his Time and Labour; he bent his Studies to various other Branches of Philosophy and the Mathematics; and even Painting itself, which seemed for a considerable Time laid aside, found a Place in those Hours he set apart for Amusement.

About the Year 1690, he was chosen a Professor of the *Royal College*, and of the *Academy of Architecture*, to which Places his great Merit advanced him; and the Diversity of his Studies and Employments cannot but give us a vast Idea of his Abilities, and of the Application of them. His Days were, indeed, generally

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spent in Study, and good Part of the Night often in astronomical Observations; seldom seeking any other Relief from his Labours, but a Change of one for another. — He was twice married, and had eight Children. He had the exterior Politeness, Circumspection, and Prudence of *Italy*; for which Country he had a singular Regard, and, on this Account, appeared too reserved and contemplative, in the Opinion of some of the *French*: Nevertheless he obtained the Character of an honest, disinterested Man, and of a good Christian. He died the 21st of April, 1718, aged 78 Years.

He was the Author of a great Number of Pieces on some of the principal Branches of geometrical and mathematical Science, viz,

I. *Nouvelle Methode en Geometrie pour les sections des superficies coniques & cylindriques*, 1673, 4to.

II. *De Cycloide*, 1677, 12mo.

III. *Nouveaux Elemens des sections coniques: Les lieux Geometriques: La construction ou effection des equations*, 1679, 12mo.

IV. *La Gnomonique, &c.* 1682, 12mo.

V. *Sectiones Conicæ in novem libros distributæ*, 1655, Folio.

This was considered as an original Work, and gained the Author a great Reputation all over *Europe*.

VI. *Tabulæ Astronomicæ*, 1687, and 1702, 4to.

VII. *Veterum Mathematicorum Opera Græcè & Latinè pleræque nunc primum edita*, 1693, Folio. This Edition had been begun by Mr. *Thevenot*; who dying, the Care of finishing it was committed to Mr. *De la Hire*. It shews, that our Author's strong Application to mathematical and astronomical Studies had not hindered him from acquiring a very competent Knowledge of the *Greek* Tongue. Besides these and other smaller Works, there are a vast Number of his Pieces scattered up and down in Journals, and particularly in the Memoirs of the Academy of Sciences.

The LIFE of NICHOLAS MERCATOR.

NICHOLAS MERCATOR, an eminent Mathematician in the 17th Century, was born in *Holstein* in *Denmark*. Biographers have not precisely mentioned the Time of his Birth; but so far as we are able to ascertain it, from his Writings and Contemporaries, it must be about the Year 1640: From his Works we likewise learn, that he had an early and liberal Education, suitable to his distinguished Genius, by which he was enabled to extend his Searches in the mathematical Science, and to make very considerable Improvements: For it appears, from his Writings as well as from the Character given of him by other Mathematicians, that his Talent rather lay in improving, and adapting any Discoveries and Improvements to Use, than Invention, as will by and by more fully appear. However, the Greatness of his Genius for the mathematical Studies was very conspicuous, and introduced him to public Regard and Esteem where he resided, and facilitated a Correspondence with such as were eminent in those Sciences both in *Denmark*, *Italy*, and *England*. Some of his Correspondents in *England* gave him an Invitation hither, which he some Time after accepted, and continued in *England* till his Death. He had not resided here long before he was admitted F. R. S. and gave very frequent Proofs of his indefatigable Application to Study, and of his great Abilities in improving some Branch or other of the Sciences. But he is charged sometimes with borrowing the Inventions of others, and adopting them as his own. — Thus about the Year 1668, Lord *Brounker* published his Quadrature of the Hyperbola, &c. which is no other than Mr. *Newton's* Series, which he discovered before: And soon after, this Quadrature of the Hyperbola was demonstrated by Mr. *Nicholas Mercator*, by Means of the Division first made use of by Dr. *Wallis* in his *Opus Arithmeticum*. Thus we may observe how far Mr. *Mercator* had any Pretence to the Discovery of the Quadrature of the Hyperbola, since Dr. *Wallis* had found the Division long before, and also the Quadrature of every Part of the Quotient; which Mr. *Mercator* should have acknowledged when he put those

those two Inventions together. But it frequently happened both with respect to Inventions and Improvements, which were more remarkable (in this Science) about this Period of History, than any other, that many of truly great mathematical Genius were willing to shine with borrowed Lustre. Our Author, however, distinguished himself by many valuable Pieces on philosophical and mathematical Subjects. His first Attempt was, to reduce Astrology to rational Principles; which proved a vain Attempt. But his Writings of more particular Note are as follow :

I. *Cosmographia, sive Descriptio Cæli & Terræ in Circulos, quâ fundamentum stermiter sequentibus ordine Trigonometriæ Sphæricorum Logarithmicæ, Astronomicæ, Sphæricæ, Geographiæ, Histiodromiæ, Gnomonicæ. Absoluto compendio pulcherrima quævis & humanis usibus aptissima, publico donantur a Nicolao Hauffman Holsato. Dantzick, 1651, in 12mo, dedicated to the Senate of that City.*

II. *Rationes Mathematicæ subductæ Anno CIC ICC LIII: Copenhagen in 4to.*

III. *De Emendatione Annuâ Diatribæ duæ, quibus exponuntur & demonstrantur Cycli Solis & Lunæ, qui ex principiis Astronomiæ hactenus cognitæ elici potuerunt accuratissimi: in 4to.*

IV. *Hypothesis Astronomica nova & consensus ejus cum observationibus: London 1664, in Fol.*

V. *Logarithmotechnia, sive Methodus construendi Logarithmos nova, accurata, & facilis; scripto antehac communicata anno sc. 1667 Nonis Augusti; cui nunc accedit Vera Quadratura Hyberbolæ & Inventio summæ Logarithmorum. Auctore Nicolao Mercatore Holsato è Societate Regiâ. Huic etiam jungitur Michaelis Angeli Riccii Exercitatio Geometrica de Maximis & Minimis, hic ob argumenti præstantiam & exemplarium raritatem recusa: London 1668, in 4to.*

VI. *Institutionum Astronomicarum Libri duo, de motu Astrorum communi & proprio, secundum hypotheses veterum & recentiorum præcipuas; deque Hypotheseon ex observatis constructione, cum Tabulis Tychonianis, Solaribus, Lunaribus, Lunæ-solaribus, & Rudolphinis Solis, Fixarum, & quinque Errantium, earumque usu præceptis & exemplis commonstrato. Quibus accedit Appendix de iis, quæ novissimis temporibus cælitus innotuerunt: London 1676, in 8vo.*
And some other miscellaneous Tracts.

The LIFE of

Sir ISAAC NEWTON.

SIR *Isaac Newton*, descended from an antient and honourable Family in *Lincolnshire*, was born on *Christmas-day*, O. S. 1642, at the Manor of *Woolstrop*e in that County, his Ancestors enjoying the Title and Estate of that Lordship for more than 200 Years, his Father being the elder Son of Sir *John Newton*, Bart. and his Mother of the antient and opulent Family of *Ascoughs* in that County. Our Author's Father dying when he was young, the Care of his Education devolved on his Mother, who, notwithstanding she married again after his Father's Death, in her great Wisdom, took Care to improve his distinguishing Genius by an early and liberal Education. — In 1654, when he was but 12 Years of Age, she sent him to the Grammar-school at *Grantham*, where he made great Proficiency in the Knowledge of Language, and laid the Foundation of his future Studies. In 1660, at the Age of 18, he was removed to *Trinity College, Cambridge*, where he principally devoted himself to the Study of the Mathematics, wherein Mr. (afterwards Doctor) *Isaac Barrow*, then Fellow of that College, was very eminent. He began his Studies, in the usual Method; with *Euclid's Elements*: The most difficult Problems of which (from his penetrating Genius) soon became easy and familiar to him. He then proceeded to the Study of *Des Cartes's* Geometry, with *Oughtred's Clavis*, *Kepler's Optics*, and *Schooten's Miscellanies*, in which he made several Improvements, which he inserted in marginal Notes as he went along, which was his common Method of studying: By Means of these Notes, and other original Papers of

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We have thought it requisite to distinguish the PRINCE of PHILOSOPHERS with an *Engraving*, (of an Octavo Size) which we have the Satisfaction to assure the Reader, is extremely like Sir *Isaac*, as we are informed by those who knew him many Years. — This Plate will be prefixed as a Frontispiece to the Volume of Biographia.

his, it is easy to shew, in some Measure, the Progress by which the Methods of Series and Fluxions were invented by him: And this continued to be his Employment and Study till 1664. —

The same Year, at the Age of 22, he took the Degree of Bachelor of Arts: And observing, at this Time, many Persons of Genius engaged in the Business of improving Telescopes, by grinding Glasses in such manner as might best subserve to that Purpose, he applied himself to the grinding of Optic Glasses of other Figures than spherical, having as yet no Apprehension of the heterogeneous Nature of Light: But not succeeding at once in the Attempt, he procured a Glass Prism, in order to try the celebrated Phænomena of Colours, discovered by *Grimaldi* not long before. He was much pleased at first with the vivid Brightness of the Colours produced by this Experiment; but, after a while, applying himself to consider them in a philosophical Way, with that Accuracy which was natural to him, he became immediately surprized to observe them in an oblong Form, which, according to the received Rule of Refractions, ought to be circular. At first, he thought the Irregularity might possibly be no more than accidental; but, as this excited his Enquiry, he soon invented an infallible Method of deciding the Question, and the Result was, his new *Theory of Light and Colours*.

However, the Theory alone, unexpected and surprizing as it was, did not satisfy him; he rather considered the proper Use that might be made of it, for improving Telescopes, which was his first Design. To this End, having now discovered that Light was not homogeneous, but an heterogeneous Mixture of differently refrangible Rays, he computed the Errors arising from this different Refrangibility; and finding them to exceed, some hundreds of Times, those occasioned by the circular Figure of the Glasses, he threw aside his Glass-works, and took the Nature of Reflectors into Consideration. He was now sensible, that optical Instruments might be brought to any Degree of Perfection desired, in Case there could be found a reflecting Substance which would polish as finely as Glass, and reflect as much Light as Glass transmits, and the Art of giving it a parabolical Figure be also attained: But, in this Enquiry, he met with considerable Difficulty, and it received, at least for some Time, no small Check, by the breaking out of the Plague in

1665. — He then retired from *Cambridge*, and was, in some Measure, secluded from Conversation and Books. However, his active Genius found some important Subjects for his mental Faculties, and, in the Midst of his Solitude, started that Hint which gave Rise to the System of the World, which is the main Subject of his *Principia*. — He was sitting alone, in a Garden, when some Apples falling from a Tree, led his Thoughts to the Subject of Gravity; and reflecting on the Power of that Principle, he began to consider, that as this Power is not found to be sensibly diminished at the remotest Distance from the Center of the Earth to which we can rise; neither at the Tops of the loftiest Buildings, nor on the Summits of the highest Mountains, it appeared to him reasonable to conclude, that this Power must extend much farther than is usually thought: “Why not as high as the Moon?” said he to himself, and if so, her Motion must be influenced by it: Perhaps she is retained in her Orbit thereby. However, though the Power of Gravity is not sensibly weakened in the little Change of Distance, at which we can place ourselves from the Center of the Earth, yet it is very possible that, as high as the Moon this Power may differ in Strength much from what it is here.” To make an Estimate what might be the Degree of this Diminution, he considered with himself that, if the Moon be retained in her Orbit by the Force of Gravity, no doubt the primary Planets are carried about the Sun by the like Power: And by comparing the Periods of the several Planets with their Distances from the Sun, he found, that if any Power like Gravity held them in their Courses, its Strength must decrease in the duplicate Proportion of the Increase of Distance. This he concluded, by supposing them to move in perfect Circles concentric to the Sun, from which the Orbits of the greatest Part of them do not much differ. Supposing therefore, the Power of Gravity, which extended to the Moon, to decrease in the same Manner, he computed whether that Force would be sufficient to keep the Moon in her Orbit. — But in this Computation (attempting it in a common Method, and absent from Books) he did not make the Power of Gravity, decreasing in a duplicate Proportion to the Distance, answerable to the Power which retained the Moon in her Orbit: Whence he concluded, that some other Cause must at least join with

with the Action of the Power of Gravity on the Moon. However, some Incidents suspended any farther Thoughts on that Subject.

On his Return to *Cambridge*, in 1667, he was chosen Fellow of his College, and, in 1668, advanced to the Degree of Master of Arts. — At this Time, *Nicholas Mercator*, who was born in *Holstein*, but spent most of his Time in *England*, published his *Logarithmotechnia*, in which he gave the Quadrature of the Hyperbola by an infinite Series. This was the first Appearance, in the learned World, of a Series of this Sort drawn from the particular Nature of the Curve, and that in a Manner very new and abstracted. — The famous Dr. *Barrow*, then at *Cambridge*, where Mr. *Newton*, who was about 26 Years of Age, resided, recollected, that he had met with the same Thing in the Writings of that young Gentleman, and there not confined to the Hyperbola only, but extended by general Forms to all Sorts of Curves, even such as are mechanical, to their Quadratures, their Rectifications, and their Centers of Gravity, to the Solids formed by their Rotations, and to the Superficies of those Solids; so that supposing their Determinations to be possible, the Series stopped at a certain Point, or at least their Sums were given by stated Rules. But if the absolute Determinations were impossible, they could yet be infinitely approximated; which is the happiest and most refined Method, says *Monsieur Fontenelle*, of supplying the Defects of human Knowledge, that Man's Imagination could possibly invent. To be Master of so fruitful and general a Theory, was a Mine of Gold to a Geometrician; but it was a greater Glory to have been the Discoverer of so surprising and ingenious a System. So that Sir *Isaac* finding, by *Mercator's* Book, that he was in the Way to it, and that others might follow in his Track, should naturally have been forward to open his Treasures, and secure the Property, which consisted in making the Discovery. But he contented himself with the Treasure he had found, without regarding the Glory. He modestly observes, in a Letter printed in the *Commercium Epistolicum*, that he thought *Mercator* had intirely discovered his Secret, or that others would, before he was of a proper Age for writing. — His Manuscript upon infinite Series was communicated to none but Mr. *John Collins*, F. R. S. and the Lord

Brounker; and even this had not been done but for Dr. *Barrow*, who would not suffer him to indulge his Modesty so much as he desired. This Manuscript was taken out of our Author's Study in 1669, intitled, *A Method which I formerly found out, &c.* and supposing this formerly to mean no more than three Years, he must then have discovered this admirable Method of his Series, when he was not 24 Years of Age. But what is still more, this Manuscript contains both the Discovery and Method of Fluxions, or those infinitely small Quantities, which have occasioned so great a Contest between Mr. *Leibnitz* and him, or rather between *Germany* and *England*.

In 1669, he was chosen Professor of the Mathematics in the University of *Cambridge*, upon the Resignation of Dr. *Barrow*; and the same Year, and the two following Years, he read a Course of optical Lectures, in *Latin*, in the public Schools of the University: He had not finished them when he was elected a Fellow of the *Royal Society* in *January* 1671-2, and having now brought his Theory of Light and Colours to a great Degree of Perfection, he communicated it to that Society first, to have their Judgment upon it, and it was afterwards published in their *Transactions* of *February* 19, 1672. In the same *Transactions* of *March* 28, 1672, N^o. 81, he published an Account of a new *Catadioptrical Telescope* of his own Invention, which Account *Monsieur Gallois* inserted in the *Journal des Sçavans*, with a Letter of *Monsieur Huygens*, shewing the Advantages of this Kind of Telescope. From this Time, till 1679, our Author maintained a Correspondence, by Letters, with Mr. *Henry Oldenburg*, Secretary of the *Royal Society*; Mr. *John Collins*, Mr. *John Flamsteed*, and Dr. *Edmund Halley*; which Letters contain a Variety of curious and useful Observations, which are published in the *general Dictionary*, including near 20 Pages, to which therefore we shall refer the Reader.

In 1676, at the Request of Mr. *Leibnitz*, he explained his Invention of infinite Series, and took Notice how far he had improved it by his Method of Fluxions, which, however, he still concealed, and particularly, on this Occasion, by a Transposition of the Letters that make up the two fundamental Propositions of it into an alphabetical Order.

In the Winter between 1676 and 1677, as Mr. *Jones* informs us, he investigated the grand Proposition, that by a centripetal Force, acting reciprocally as the Squares of the Distance a Planet must revolve in an Ellipsis about the Center of Force placed in the lower Focus of the Ellipsis, and, with a Radius drawn to that Center, describe Area's proportional to the Times.

In 1680, he made several astronomical Observations upon the Comet that then appeared, which, for some considerable Time, he took not to be one and the same, but two different Comets. He was at an Uncertainty in this Matter, when he received a Letter from Mr. *Hooke* on the Nature of the Line described by a falling Body, supposed to be moved circularly by the diurnal Motion of the Earth, and perpendicularly by the Power of Gravity: This led him farther to enquire what was the real Figure in which such a Body moved, and, as *Picart* had not long before, viz. in 1679, measured a Degree of the Earth with sufficient Accuracy, by using his Measures, that Planet appearing to be retained in her Orbit by the sole Power of Gravity, and consequently that this Power decreases in the duplicate Proportion of the Distance, as he had formerly conjectured: Upon this Principle he found the Line described by a falling Body, to be an Ellipsis, of which the Center of the Earth is one Focus. And finding, by this Means, that the primary Planets really moved in such Orbits as *Kepler* had supposed, he had the Satisfaction to find the Result of his Enquiries to answer some valuable Purposes: Accordingly, he drew up sundry Propositions relative to the Motion of the primary Planets round the Sun, which were communicated to the *Royal Society* in 1683, and, with much Solicitation, printed in 1687, under the Title of *Philosophiæ naturalis principia Mathematica*, containing, in the third Book, what is now denominated his *Cometic Astronomy*, or rather his *System of the World*.

In the Height of all these profound philosophical Researches, the Privileges of the University being attacked by King *James II.* our Author appeared among the most hearty Defenders, and was, on that Occasion, appointed one of their Delegates to the High Commission Court, when he made such a rational and vigorous

gorous Defence, that King *James* thought proper to drop the Affair, and continue their Privileges.

In 1688, our Author was chosen one of their Members for the Convention Parliament, in which he sat till it was dissolved.

Obstructions being in a great Measure removed, he re-assumes his former Studies, on the Motion of the primary Planets round the Sun, to which he was somewhat led by Conversation with Dr. *Halley* (who paid him a Visit at *Cambridge* :) It gave Occasion to his writing the above-mentioned Treatise of *Mathematical Principles of natural Philosophy*, a second Edition whereof was afterwards published at *Cambridge*, with great Additions, under the Care of Mr. *Roger Cotes*, Professor of Astronomy and experimental Philosophy. *Monsieur de Fontenelle* tells us, that this Book, in which our Author had built a new System of natural Philosophy upon the most sublime Geometry, was wrote with so great Profoundness of Judgment, and withal so concise, that it required some Time and Skill thoroughly to understand it; on which Account, it was not so generally read and admired: But at Length, when its Worth came to be sufficiently known, nothing was to be heard from all Quarters but one general Shout of Admiration. This Work seems to be the Production of a Genius, or of a celestial Intelligence, rather than a Man, says the Marquis *de l'Hospital*, one of the greatest Mathematicians of the Age. And when he was visited by some *English* Gentleman, it is said, he asked "if Mr. *Newton*, eat, drank, or "slept like other Men?" I represent him to myself (says he) as a celestial Genius, intirely disengaged from Matter. The *Principia Mathematica* are founded chiefly on two Theories, viz. the Doctrine of central Forces, and that of the Resistance of Mediums to Bodies moving in them, both almost entirely new, and treated according to our Author's sublime Geometry. ——— *Kepler* had found from the celestial Observations of *Tycho Brahe*, I. That the same Planets described about the Sun equal Areas in equal Times. II. That their Orbits were Ellipses, the Sun being in the common Focus. III. That in different Planets, the Squares of periodic Times were, as the Cubes of the transverse Axes of their Orbits. From the first Phænomenon our Author demonstrated, that the Planets were attracted towards
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the Sun in the Center ; from the Second, that the Force of this Attraction was reciprocally as the Squares of the Distances of the Planet from this Center ; and from the Third, that all the Planets were influenced by the very same centripetal Force.

Our Author's Merit became now so well known; that even Men of the highest Rank, as well as Genius, carested him : And in 1696, when the Earl of *Hallifax* undertook the great Work of recoinning the Money, he made Choice of Mr. *Newton* for his Assistant ; and, accordingly, he was appointed Warden of the Mint, in which Employment he did very signal Service to the Nation. About three Years after, he was promoted to be Master of that Office, a Place worth 12 or 1500*l.* *per Ann.* which he held till his Death ; for which he appears to be peculiarly qualified, by his Tables of the Effays of Foreign Money; printed at the End of Dr. *Arbutnot's* Book. — Upon this Promotion, he appointed Mr. *William Whiston*, then M. A. of *Clare Hall*, his Deputy in the mathematical Professorship at *Cambridge*, giving him the full Profits of the Place, which, too, he procured for him in 1703.

The same Year, our Author was chosen President of the *Royal Society*, in which Chair he sat for 25 Years ; and he had been chosen a Member of the *Royal Academy of Sciences* at *Paris* in 1699; upon the new Regulation made of admitting Foreigners into that Society.

In 1704, our Author published, in 4to, his *Treatise of the Reflections, Refractions, Inflections, and Colours of Light* : Which was afterward translated into a Variety of Languages, and passed through several Editions. *Monsieur Fontenelle* observes, that the constant Object of this Work is the Anatomy of Light. — The smallest Ray of Light admitted into a perfectly dark Room, which yet can never be so small but that it is, like a *Fasciculus*, composed of an infinite Number of Rays; is divided and dissected, so as to leave the Elementary Rays, which composed it, distinct from each other, each tinged with a particular Colour, and incapable of being farther altered after this Separation. — The Whiteness of the whole Beam, before its Dissection; arose from the Mixture of all the particular Colours of the original Rays. The primitive and coloured Rays could not possibly be separated, if their Nature were not such, that in passing through the same

Medium, through the same Glass-prism, they are refracted under different Angles; and by that Means appear disunited, when received at convenient Distances. This different Refrangibility of red, yellow, green, blue, violet, and the infinite Variety of intermediate coloured Rays, a Property which had never been dreamed of, and to which no Conjecture could ever lead us, is the fundamental Discovery of our Author's Treatise. The different Refrangibility leads us to the different Reflexibility, and, which is still more curious, Rays, falling upon a Surface under the same Angle of Incidence, are alternately refracted and reflected, with a Kind of Play, which could never have been distinguished but by a very good Eye, assisted by an excellent Judgment. Besides (and in this Point only the first Notion was not our Author's) those Rays, which pass near the Extremity of a Body without touching it, are nevertheless thereby turned aside out of the Right-line; and this he calls Inflexion. He shews likewise, that the Cause why Bodies appear of different Colours, arises from the Magnitude of the constituent Particles of Bodies. From all these Observations together, he has formed a Body of Optics so new, that this Science may be considered as entirely owing to our Author. — It has been remarked, that our Author's Hypothesis of Light and Colours frees the Corpuscularian Philosophy from the Embarrass of an Argument, which *Aristotle* brought against that Doctrine, of sensible Qualities being the Result of the Figures and Dispositions of the insensible Parts, or Atoms: — But *Sir Isaac's* Hypothesis, which makes Colours the innate Property of the Rays of Light, and that different Kinds of Rays originally and immutably assert a Colour peculiar to themselves, entirely takes off the Force of this Argument.

In Reality, the Affair that chiefly employed his Researches for so many Years, was far from being confined to the Subject of Light alone: On the contrary, all that we know of natural Bodies seem to be comprehended in it: He had found out, that there was a mutual Action, a Distance between Light and other Bodies, by which both the Reflections and Refractions, as well as Inflexions of the former, were constantly produced. He has, indeed, opened a Way of passing from Optics to an entire System of Physics; and if we only look upon his Queries, as contain-

ing the History of a great Man's first Thoughts, even in that View they must be always entertaining and curious.

In 1705, he had the Honour of Knighthood conferred upon him by Queen *Ann*, in Consideration of his great Merit. —

In 1707, he published, at *Cambridge*, in Octavo, his *Arithmetica Universalis, sive de Compositione & Resolutione Arithmeticae Liber*. — In 1711, his *Analysis per Quantitatum Series, Fluxiones, & Differentias, cum Enumeratione Linearum tertii Ordinis*, was published at *London*, by *William Jones*, Esq; F. R. S. who met with the first of those Pieces amongst the Papers of Mr. *John Collins*. — In 1712, several Letters of Sir *Isaac* were published in the *Commercium Epistolicum*.

Soon after the Accession of his Majesty King *George I.* our Author's Talents were so conspicuous that he was introduced to his Majesty, with peculiar Marks of Esteem; and that Year he was applied to, by Parliament, for his Opinion upon a new Method of discovering the Longitude at Sea, by Signals, which had been proposed by *Ditton* and *Whiston*, in order to procure their Encouragement. But his Remarks, and Reasons assigned for his Disapprobation of it, in a Paper delivered to the Committee, was so entirely Satisfactory, that the Project was thrown aside.

The following Year, viz. 1715, Mr. *Leibnitz*, with a View of bringing the World more easily into the Belief, that Sir *Isaac* had borrowed his *Method of Fluxions* from his *differential Method*, attempted to try his mathematical Genius by the famous Problem of the Trajectories, which, though it was the most difficult Proposition the Wit of his Antagonist could propose, was nothing more than an Amusement to our ethereal Genius, as he solved it the same Evening he received it, though he had been fatigued that Day with the Business of the Mint. But the Greatness of our Author's Abilities, and his Popularity on that Account, were very often likely to occasion Disputes as to their first Discovery or Improvement, which he carefully avoided whenever the Importance of Truth, or his own just Vindication did not render it necessary.

He was now more than ever at Court. The Princess of *Wales*, afterwards Queen Consort to King *George II.* had such a Taste for philosophical Enquiries, and so excellent an Understanding therein, that she frequently conversed with him on those Sub-

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jects, and proposed such Queries, as none but himself could answer to her Satisfaction. And she was often heard to declare in Public, that she thought herself happy in living at the same Time, and enjoying the Opportunities of Improvement by him.

—— He had then written a Treatise of ancient Chronology, or was about it in 1718, when he communicated to that Princess the chief Particulars of his Plan, which she thought so new and ingenious, that she desired to have an Abstract of the whole Work, which she would never part with. Nevertheless, a Copy of it stole abroad, and was carried over to *France*, by the Abbé *Conti*, where it was translated and printed, with some Observations upon it. — Upon this Sir *Isaac* published in the *philosophical Transactions*, N^o. 389, v. 33, p. 315, *Remarks thereon*, which were afterwards translated into *French* by the Observer. And the Abbe *Conti* and Father *Souciet* attacked our Author's Chronological Index. And a full Reply was soon after given to it by Dr. *Edmund Halley*, who was the King's Astronomer, especially to that Part of it which related to Astronomy.

—— This Work at Length was published in *English*, and of the Few that were Judges there were Diversity of Opinions. The main Design was evidently this, to find out, by following with Abundance of Sagacity some of the Tracks, however faint they are of the most ancient *Greek* Astronomy, what was the Position of the equinoctial Colures with respect to the fixed Stars, in the Time of *Chiron* the Centaur. As it is now known that these Stars have a Motion in Longitude of one Degree in 72 Years, and if it is once known through what fixed Stars the Colure passed in *Chiron's* Time, by taking the Distance of these Stars from those through which it now passes, we might determine what Number of Years is elapsed since *Chiron's* Time. As *Chiron* was one of those who went along with the *Argonauts* in their famous Expedition, this would therefore fix the Epocha of that Expedition, and consequently that of the *Trojan* War; two great Events, upon which all ancient Chronology depends.

After having been so serviceable to all the learned Part of *Europe* in speculative Sciences, he devoted himself more entirely to the Service of his Country, in Affairs to which he was more especially called; but his Leisure-time he devoted to gratify the Curiosity of his Mind: He thought no kind of Knowledge beneath

neath his Consideration, and he knew how to improve himself by even a superficial View of Things. After his Death there were found amongst his Papers, several Writings upon Antiquity, History, and Divinity, Subjects widely different from each other, and from those for which he was so much distinguished. He never suffered Time to pass unemployed, nor ever spent it after a trifling Manner, or with slight Attention to what he was about. He all along enjoyed a settled and equal State of Health, until he was fourscore Years of Age, a very essential Circumstance of the extraordinary Happiness he enjoyed. — He then began to be afflicted with an Incontinence of Urine, and yet the five Years following, which preceded his Death, he enjoyed long Intervals of Health, or was tolerably well, owing, next to Providence, to that Care and Regularity he observed with regard to his Diet. — The last twenty Days of his Life were attended with much Pain, at some Intervals, and it was concluded he had the Stone in his Bladder, and that he could not recover. In those Fits of Pain, which were so violent that Drops of Sweat fell from his Face, he never cried out nor expressed the least Impatience; and as soon as he had a moment's Ease, he would smile, and talk with his usual Chearfulness. Till this Time he had always read and wrote several Hours in a Day: And on *Saturday Morning, March 18, 1726*, discoursed a long Time with *Dr. Mead*, his Physician, having then the perfect Use of all his Senses and Understanding; but that Night he entirely lost them, and did not recover them any more, and died on *Monday, March the 20th*, in the 85th Year of his Age. His Corpse lay in State in the *Jerusalem Chamber*, and on the 28th was conveyed into *Westminster Abbey*, the Lord Chancellor, the Dukes of *Montrose* and *Roxburgh*, and the Earls of *Pembroke*, *Suffex*, and *Macclesfield* supporting the Pall. He was interred near the Entrance into the Choir, on the Left-hand, where a stately Monument is erected to his Memory, with the following Inscription:

H. S. E.

Isaacus Newton, Eques Auratus,
 Qui animi vi prope divina
 Planetarum motus, figuras,

The Life of Sir ISAAC NEWTON. 373

Cometarum semitas, Oceanique æstus,
Sua mathesi faciem præferente,
Primus demonstravit.

Radiorum lucis dissimilitudines,
Colorumque inde nascentium proprietates,
Quas nemo antea vel suspicatus erat, peruestigavit.

Naturæ, Antiquitatis, S. Scripturæ,
Sedulus, sagax, fidus interpres,
Dei. Opt. Max. majestatem philosophia asseruit,
Evangelii simplicitatem moribus expressit.

Sibi gratulentur mortales, tale tantumque extitisse,
HUMANI GENERIS DECUS.

Natus xxv. Decemb. MDCXLII. Obiit. xx. March,
MDCCXXVI.

His Character has been attempted by many, more especially by *Monsieur Fontenelle*, *Dr. Pemberton*, and several others, the Substance whereof is as follows :

He was of a middling Stature, and somewhat inclined to be fat in the latter Part of his Life. His Countenance was pleasing and venerable. He never made use of Spectacles, and during his whole Life never lost but one Tooth. Bishop *Atterbury* describes him as having something rather Languid in his Look and Manner, than lively and piercing. — He was of a very meek Disposition, and a great Lover of Peace. He would rather have chosen to remain in Obscurity, than to have the Calm of Life ruffled by those Storms and Disputes, which Genius and Learning often draw upon those that are eminent for them. In contemplating his Genius, it presently becomes a Doubt which of these Endowments had the greatest Share, Sagacity, Penetration, Strength, or Diligence; and after all, the Mark that seems most to distinguish it, that he himself made the justest Estimation of it, declaring, if he had done the World any Service, it was owing to Industry and patient Thought, that he kept the Subject under Consideration constantly before him, and waited till the first Dawning opened gradually into a full and clear Light: And hence, no Doubt, arose that Aversion he had to all Disputes, a steady uninterrupted Attention, free

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from those frequent Recoilings inseparable from many others, was his peculiar Felicity. He knew it, and he knew the Value of it; and speaking of some Errors which he had too hastily published, which occasioned some Dispute, he says, I blame my own Imprudence for parting with so real a Blessing as my Quiet, to run after a Shadow. Though, as *Fontenelle* justly observes, this little Foible at first proved the Occasion of his much greater Sollicitude to be exact in his future Productions, and thereby proved the Instrument of much greater Usefulness.

After all, notwithstanding his anxious Care to avoid every Occasion of breaking his intense Application to Study, he was far from being swallowed up and lost in it; he could lay aside his Thoughts, though engaged in the most intricate Researches, when his other Affairs required his Attendance, and, as soon as he had Leisure, resume the Subject at the Point where he had left it. This he seems to have done, not from any extraordinary Strength of Memory as by the Force of his inventive Faculties, to which every Thing opened itself again with Ease, if nothing intervened to ruffle him; the Readiness of his Invention made him not think of putting his Memory much to the Rack: But this was the Offspring of a vigorous Intenseness of Thought, out of which he was but a common Man. He spent, therefore, the Prime of his Life in those abstruse Researches, when his Situation in a College gave him Leisure, and even while Study was his proper Profession: But, as soon as he removed himself to the Mint, he principally attended to the Business of that Office.

Dr. *Pemberton* observes, that he read but few modern Authors, or, at least, but superficially: But, as cursory as it might seem, it appears, he could form his Judgment of them with great Accuracy. He often censured handling geometrical Subjects by Algebraic Calculation, and therefore called his Book of Algebra *Universal Arithmetic*, in Opposition to *Des Cartes's* Book of Geometry. — He frequently praised *Slusius*, *Barrow*, and *Huygens*, for not being influenced by the false Taste that then began to prevail. — He commended the laudable Attempt of *Hugh de Omerique*, to restore the ancient Analysis; and very much esteemed *Apollonius's* Book *de Sectione Rationis*, for giving us a clearer

clearer *Notion* of that Analysis than we had before. —

Dr. *Barrow* he esteemed, as having shewn a Compass of Invention equal, if not superior, to any of the Moderns. —

Sir *Isaac* commended *Huygens's* Stile and Manner of Writing, and thought him the most Elegant of any mathematical Writer in modern Times, and the most just Imitator of the Ancients, of whose Taste and Form of Demonstration Sir *Isaac* always professed himself a great Admirer, and often censured himself for not following them more exactly than he did.

It is farther observed of him, that he seldom talked much of himself, or others; nor ever behaved in such Manner as to give the most malicious Censurers the least Occasion to charge him with Vanity. — He was candid and affable, and always put himself upon a Level with his Company. He never thought either his Merit or Reputation sufficient to excuse him from any of the common Offices of social Life; no Singularities, either natural or affected, distinguished him from other Men. Though he was steadily attached to the Church of *England*, he was greatly averse to the Persecution of Nonconformists. He judged of Men by their Manners; and the true Schismatics, in his Opinion, were the vicious and immoral: Not that he confined his Principles to natural Religion; for he was thoroughly persuaded of the Truth of Revelation, and, amidst the great Variety of Books which he had constantly before him, that which he studied with the greatest Application was, the *Bible*. He did not neglect the Opportunities of doing Good, which the plentiful Revenues of his Patrimony, and a profitable Employment, improved by a prudent Oeconomy, put into his Power. “He thought a Legacy, says *Monsieur de Fontenelle*, was no Gift, and, therefore, left no Will; for he would even strip himself, as often as he had Occasion, to assist either his Relations or others, who stood in Need of it: The Instances of his Liberality, in both these Respects, were neither few nor inconsiderable.” — He died possessed of Thirty-two Thousand Pounds, which was in Estate, and is said to devolve, as the Law directed, to his next of Kin. — When Decency, upon any Occasion, required Expence and Shew, he was magnificent without grudging it; and, with a
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very good Grace, at all other Times, that Pomp, which seems great to low Minds only, was utterly retrenched, and the Expence saved for better Uses. He never married; which was always attributed to his being so deeply immersed in profound and continual Studies during the prime Part of his Life, and his other important Employments.

Mr. *Hume*, in his History of *England*, speaks of Sir *Isaac* to the following Purport: “ In *Newton* (says he) this Island may boast of having produced the greatest and rarest Genius that ever arose, for the Ornament and Instruction of the Species in philosophical, astronomical, and mathematical Knowledge; cautious in admitting no Principles but such as were founded on Experiment; but resolute to adopt every such Principle, however new or unusual; from Modesty, ignorant of his Superiority above the rest of Mankind, and thence less careful to accommodate his Reasonings to common Apprehensions, more anxious to Merit than acquire Fame. He was from these Causes long unknown to the World; but his Reputation at last broke out with a Lustre which scarce any Writer before his Time ever attained: While *Newton* seemed to draw off the Veil from some of the Mysteries of Nature, he showed at the same Time the Imperfections of the mechanical Philosophy, and thereby restored her ultimate Secrets from that Obscurity in which they had before lay, and in which, without his Assistance, would probably ever have remained.

And another ingenious Author, in a Kind of Rhapsody, says, the *Newtonian* Philosophy alone, to what sublime Sentiments does it lift the Mind! what noble Ideas does it give us of Immenfity, filled with innumerable Worlds revolving round innumerable Suns! those Worlds themselves the Centres of others, Secondary to them all, all attracting or attracted, enlightening or receiving Light, at Distances unmeasurable! but all under one Law.——How do these Ideas tend to raise our Conceptions of the great Author, and first Cause of those Worlds, and excite our Admiration!

The LIFE of JOHN FLAMSTEED.

JOHN FLAMSTEED, an eminent *English* Astronomer, was born at *Denby* in *Derbyshire*, on the 19th of *August*, 1646: He was educated at the Free-school of *Derby*, where his Father lived, and at 14 Years of Age was visited with a severe Fit of Illness, which impaired his Constitution, and prevented his going to the University, for which he was intended; but this did not wholly obstruct his Learning, as he applied himself, with as much Assiduity as he was capable of, to his Studies; and in the Year 1662, after he had made all the Improvements he could in the Grammar-school, he pursued the most natural Bent of his Genius, which led him to the Study of Astronomy, and read, with great Attention, *Sacrobosco's* Book *De Sphæra*, which laid the Ground-work of all that mathematical and astronomical Knowledge for which he became afterwards, so justly celebrated. The particular Improvements he made in these Sciences are minutely specified in a Manuscript of his, written in 1677, intitled, *The Self-inspections of J. F.* containing an Account of himself, his Actions and Studies for 21 Years; to which we may refer the Curious. Having translated so much of *Sacrobosco's* Book as he thought necessary, into *English*, he endeavoured to procure such others as might contribute to his Improvement, among which was Mr. *Street's* *Caroline Tables*: He set himself to calculate the Places of the Planets; he spent some Part of his Time also in astrological Studies; yet so as to make them subservient to Astronomy; for he was never the least captivated by the solemn Pretensions of that vain Science: Having calculated, by the *Caroline Tables*, an Eclipse of the Sun, which was to happen the 22d of *June*, 1666, he imparted it to a Relation, who shewed it to Mr. *Hall*, a Mathematician, who came to see Mr. *Flamsteed* soon after, and finding he was not well acquainted with many astronomical Performances, he sent him *Ricciolus's Almagestum Novum*, and *Kepler's Tabulæ Rudolphinæ*, to which he was before a Stranger: And he prosecuted his astronomical Studies, from this

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Time, with all imaginable Vigour, and with all the Success that could be wished for. — In 1669, he collected some remarkable Eclipses of the fixed Stars by the Moon, which would happen in 1670, and calculated them from the *Caroline Tables*, and sent them to Lord Viscount *Brounker*, President of the *Royal Society*. This Piece, being read before that Society, was highly approved, and procured him Letters of Thanks from Mr. *Oldenburg* their Secretary, and Mr. *John Collins* one of their Members, with the latter of whom our Author held a Correspondence several Years, by Letters, many of which were carefully kept in the Library of *William Jones*, Esq; F. R. S. some Particulars of which we shall occasionally insert; from the Time, of the abovementioned Piece being read to the Society, he began to have Accounts sent him of the principal mathematical Books which were published, either at home or abroad; and in June, 1670, his Father, observing he held Correspondence with many ingenious Gentlemen, advised him to take a Journey to *London*, that he might be personally acquainted with them, which Offer he gladly embraced, and visited Mr. *Oldenburg* and Mr. *Collins*, who introduced him to Mr. *Jonas Moore*, and presented him with Mr. *Townley's Micrometer*, and undertook to procure him Glasses for a Telescope. On his Return, he visited Dr. *Barrow*, Mr. *Newton*, and Dr. *Wroe*, then Fellow of *Jesus College*, of which he also entered himself a Student. — In the Year 1672, he excerpted several Observations from Mr. *Gascoigne's* and Mr. *Crabtree's* Letters, which had not been made public, and which he translated into *Latin*. He finished the Transcript of Mr. *Gascoigne's* Papers in May, 1672: Amongst that Gentleman's Letters he found some in which Mr. *Gascoigne* shewed how the Images of remote Objects were formed in the distinct Base of a Convex Object-glass; from thence our Author got his Knowledge of *Dioptrics*, having read *Des Cartes's Dioptrics* before to little Purpose, because *Des Cartes* discourses not of this Subject; his main Business being to shew how, by elliptical or hyperbolic Glasses, all the Rays of Light which fall on the Object, parallel to the Axis, may be collected into one Point of the Image in the distinct Base, supposing all the Rays of Light of the same Species, and liable to the same Law of Refraction,

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which Mr. *Isaac Newton* has demonstrated they were not, by many Experiments published in this Year's *Philosophical Transactions*: And this, says our Author, is the only Thing that I can perceive for which *Des Cartes's Dioptrics* have been so celebrated. — The spare Hours of the remaining Year, Mr. *Flamsteed* employed in his Observations, as the Weather permitted, and in preparing Advertisements of the Appulses of the Moon and Planets to fixed Stars, for the following Year. These were published by Mr. *Oldenburgh* in the *Philosophical Transactions*, with some Observations of the Planets, which Mr. *Flamsteed* imparted to him. — In 1673, he wrote a small Tract in *English* concerning the true Diameters of all the Planets, when at their nearest Distances from the Earth, or their greatest Removes from it; “ which I lent, says he, to Mr. *Newton* in 1685, who has made Use of it in the fourth Book of his *Principia Phil. Nat. Mathemat.*” By Mr. *Oldenburgh's* Means he exchanged some Letters with *Monsieur Cassini*. — In 167 $\frac{3}{4}$, he wrote an Ephemeris, to shew the Falsity of Astrology, and the Ignorance of those who pretended to it; and gave a Table of the Moon's Rising and Setting, carefully calculated: Together with the Eclipses and Approaches of the Moon and Planets to the fixed Stars. This fell into the Hands of Sir *Jonas Moore*, for whom, at his Request, Mr. *Flamsteed* made a Table of the Moon's true Southings that Year, from which, and from Mr. *Philips's* Theory of the Tides, the High-waters being computed, he found that they shewed the Times of the Turn of the Tides very near; whereas, the common Seamen's coarse Rules would err sometimes 2 or 3 Hours. — In 1674, our Author passing through *London* in his Way to *Cambridge*, Sir *Jonas Moore* informed him, that a true Account of the Tides would be highly acceptable to his Majesty: Upon which, he composed a small Ephemeris for his Majesty's Use, which he compleated by *Christmas*. — Mr. *Flamsteed* often discoursed of the Weather-glass, or Barometer, and the Certainty of judging of the Weather by it, from the Observations which Mr. *Townley* had communicated, and the Rules he had deduced from them: And afterward he set up a Barometer at *Derby*, where, for three Years together, he noted thrice a Day the Height of the Mercury in
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the Barometer, and of a tinged Spirit in the Thermometer, and found, considering the different Situation, that Mr. *Townley's* Remarks agreed very well with his, which were, that, upon every sinking of the Mercury, the Air was more moved; and that either Wind or Rain followed, not the same Day always, but one, two, three, or four Days after, according to the Time and Height it had been stationary at. Something of this had been noted by Mr. *Boyle*, but not prosecuted, by Reason that the daily watching its Motions, and noting them, was thought perhaps a Trouble. About this Time, Mr. *Flamsteed*, at Sir *Jonas Moore's* Request, set up for him a Pair of these Glasses, and left him Materials for making more. It had been long settled fair Weather when Mr. *Flamsteed* left *London*; soon after which, the Mercury in the Glasses began to sink, but no Rain followed till the fourth, or fifth Day after: This made Sir *Jonas* esteem the Glasses and Rules very highly, and mentioned them as Curiosities to the King and Duke of *York*, whereupon he was ordered to exhibit them the next Day, which he did, together with Mr. *Flamsteed's* Directions for judging of the Weather by their rising or falling. Sir *Jonas* was a great Friend to our Author, and took all Opportunities of introducing his Inventions and Improvements to his Majesty, and ever frankly disclaiming any Pretensions to Discoveries which justly belonged to Mr. *Flamsteed*; whereby he laid a Foundation for his reaping Advantages from Royal Favour, as was very evident in After-time. Indeed, he might have enjoyed some present Emoluments from Sir *Jonas's* having ingratiated him into his Majesty's Friendship: But, as Mr. *Flamsteed* had now taken his Degree of *Master of Arts* at *Cambridge*, with a Design to enter into holy Orders, and aimed at settling himself in a small Living near *Derby*, which had been promised by a Friend, this limited his Pursuit of greater Honour or Riches. However, Sir *Jonas*, zealous of promoting his Advantage, wrote to him to come to *London*, with a Design to procure him a better Support: And he came at his Invitation to *London*, and resided for some Time at that Gentleman's House: During this Interval, Sir *Jonas* brought Mr. *Flamsteed* a Warrant to be the King's Astronomer, with a Salary of 100*l.* per Annum. This, however, did not abate our

Author's Inclinations for Orders, and he was accordingly ordained at *Ely* by Bishop *Gunning*, who ever afterwards conversed freely with him, and particularly upon his new Philosophy and Opinions, which Mr. *Flamsteed* was always ready and well qualified to defend. — On the 10th of *August*, 1675, the Foundation of the Royal Observatory at *Greenwich* was laid, and during the Building of it, Mr. *Flamsteed*'s temporary Observatory was in the Queen's House, where he made his Observations of the Appulses of the Moon and Planets to the fixed Stars, and wrote his Doctrine of the Sphere, which was afterward published by Sir *Jonas*. — About the Year 1684, he was presented to the Living of *Burslow* in *Surry*, which he held indeed as long as he lived; but always intent on making Improvements whenever the Duties of his Function did not engage him. This however, as it raised him to the Notice of the World, and recommended him to royal Favour and Protection, so it likewise procured him the Friendship and Confidence of some of the most illustrious Persons in the Knowledge of the philosophical, astronomical, and mathematical Sciences; such as the incomparable Sir *Isaac Newton*, Dr. *Edmund Halley*, Dr. *John Wallis*, the celebrated *Cassini*, to whom respectively he communicated the Improvements he had made, and by whom many of them were communicated to the *Royal Society*, and some of them are printed in the *Philosophical Transactions*; others preserved in the Libraries of his ingenious Correspondents, and, through their Means, have been communicated to Posterity. Among many others, Mr. *Hodgson* has in his Possession above 20 Letters that passed between our Author and Sir *Isaac Newton*, from the Year 1680 to 1699; and a great many others to him from Mr. *Cassini*, and other eminent Persons. Dr. *Wotton*, in his Reflections upon ancient and modern Learning, styles our Author one of the most accurate Observers of the Planets and Stars, and that he calculated Tables of the Eclipses of the several Satellites, according to which Astronomers, in the different Quarters of the World, having Notice of the precise Time when to look for them, have found them to answer to his Predictions, and made their Observations accordingly. Mr. *Molyneux*, in his *Dioptrica Nova*, gives him a great Character;

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and, in the Admonition to the Reader prefixed to the Work, observes, that the geometrical Method of calculating a Ray's Progress is wholly new, and never before published; and for the first Intimation thereof, says he, I must acknowledge myself obliged to my worthy Friend, Mr. *Flamsteed*.

But that which is of all others the most remarkable is, his *Historia Cœlestis Britannica*, published in *London* in 1725. The first Volume contains, the Observations of Mr. *William Gascoigne*, the first Inventor of the Way of measuring Angles in a Telescope by the help of Screws, and the first who applied telescopical Sights to astronomical Instruments, taken at *Middleton* near *Leeds* in *Yorkshire*, betwixt the Years 1638 to 1643, excerpted from his Letters by Mr. *Crabtree*, with some of Mr. *Crabtree's* Observations about the same Time; as also, Observations of the Sun's and Moon's Diameters, Configurations, and Elongations of *Jupiter's* Satellites from him, small Distances of fixed Stars, with Appulses of the Moon and Planets to them, observed with a Telescope and Micrometer at *Derby*, by himself, betwixt the Years 1670 and 1675, with the larger mutual Distances of the fixed Stars, and of the Planets, from them; Eclipses of the Sun, Moon, *Jupiter's* Satellites, Spots on the Sun, Comets, and Refractions, taken with a Sextant of near seven Feet Radius, a valuable Quadrant, and the above-mentioned Instruments, betwixt the Years 1675 and 1689, at the Royal Observatory, ranked under proper Heads, with the Places of the Moon, *Saturn*, *Jupiter*, *Mars*, *Venus*, and *Mercury*, deduced from the Observations; and also necessary Tables to be used with them. — The second Volume contains, his Observations (made with a mural Arch of near seven Feet Radius, and 140 Degrees on the Limb) of the meridional Zenith Distances of the fixed Stars, Sun, Moon, and other Planets, with the Times of their Transits over the Meridian; together with Observations of the Sun's and Moon's Diameters, Eclipses of the Sun, Moon, and *Jupiter's* Satellites, Variations of the Compass, from 1689 to the End of the Year 1719, &c. with Tables shewing how to render the Calculation of the Stars and Planets Places, from the Observations, easy and expeditious: To which are added, the Places of the Moon (at her Op-

positions, Quadratures, and on her Limits, &c.) and the Places of *Saturn, Jupiter, Mars, Venus, and Mercury*, derived from the abovementioned Observations. — The third Volume contains, a Catalogue of the Right-ascensions, Distances from the Pole, Longitudes and Magnitudes of near 3000 fixed Stars, with Variations of their Right-ascensions and Distances from the Pole, whilst they change their Longitudes one Degree, whereby the Right-ascensions and Distances from the Pole of the Stars and Planets being given, their Longitudes and Latitudes may be found by Inspection. To this Volume is prefixed a very large Preface, containing an Account of all the astronomical Observations made before his Time, with a Description of the Instruments made Use of; as also his own Observations and Instruments, with a new *Latin* Version of *Ptolomy's* Catalogue of 1026 fixed Stars, from the *Greek*, and *Uleg-beig's* Places annexed on the *Latin* Page, with the Corrections, small Catalogue of the *Arabs*, *Tycho Brahe's* of about 780 fixed Stars in a proper Order. The *Landgrave of Hesse's* of 386. *Hevelius's* of 1534 in a proper Order. A Catalogue of some of the Southern fixed Stars not visible in our Hemisphere, reduced to Right-ascension, Distance from the Pole; Longitude, with Variations of Right-ascension and Distances from the Pole, calculated from Observations made by *Dr. Haley* at *St. Helena*, and *Mr. Flamsteed's* Places of the Stars, and fitted to the Year 1726. This Work he prepared in great Measure for the Press, with great Care and Accuracy: But through a natural Weakness of Constitution, and the Declines of Age, he died before he had finished it, which was on the 19th Day of *December*, 1719, occasioned by a Strangury, aged 73 Years, leaving a disconsolate Wife, who, pursuant to his Will, published this valuable Work in Conjunction with *Mr. Hodgson*, and dedicated it to the King in 1725. These, his Works, do Honour to his Memory, and are sufficient to perpetuate the same with great Esteem amongst the Learned in these Sciences, and some have been before-hand in paying Tribute to his Merit.

Mr. Stephen Gray, in a Letter, dated from *Canterbury*, describing a very ingenious Instrument invented by him for drawing a true Meridian Line by the Pole Star, and also for finding the

the Hour of the Night, has the following Passage: “ That most learned, accurate, and judicious Astronomer, Mr. *John Flamsteed*, has lately discovered, that there is a Parallax of the Earth’s annual Orbit at the Pole Star, of about 40 or 45[“], whereby the Diameter of the Star’s Parallel is greater in *June* than in *December*, by about one Minute, two Seconds, which he has evinced from seven Years successive Observations, whereby the Earth’s Motion has been indubitably demonstrated, as appears from his learned Letter to Dr. *Wallis*, on that Subject.”*

Dr. *Wotton*, who was a Person of universal Knowledge, produces the Labours and Discoveries of Mr. *Flamsteed*, to prove, that the ancient Astronomy was not at all comparable with the Modern, or which is the same Thing, that modern Astronomers have far surpassed the Ancients in Point of Accuracy as well as Extensiveness in their Observations.

The great Mathematician, Dr. *John Keill*, has said of Mr. *Flamsteed*, that, with indefatigable Pains for more than 40 Years, he has watched the Motions of the Stars, and has given us innumerable Observations of the Sun, Moon, and Planets, which he made with very large Instruments, exactly divided with most exquisite Art, and fitted with telescopical Sights; whence we are to rely, says he, more on the Observations he made, than on those that went before him, who made their Observations with the naked Eye, without the Assistance of Telescopes.

Mr. *Molineux*, Dr. *Halley*, and other eminent Mathematicians and Astronomers, as well abroad as at home, have given high Encomiums on Mr. *Flamsteed*; but what we have inserted, we think may suffice.

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* This has since been proved to be a Mistake by the more accurate Instruments and Observations of late Astronomers; as we are well assured that the Parallax of a fixed Star cannot amount to so much as a single Second without being observed.

*The LIFE of (GODEFROY) WILLIAM DE
LEIBNITZ.*

WILLIAM de LEIBNITZ, an eminent Philosopher and Mathematician, was born at *Leipsic* in *Saxony*, June 23, 1646: He was the Son of *Frederic Leibnitz*, Professor of Ethics, and Secretary of the University of *Leipsic*; who dying when *William* his Son was very young, the Care of his Education devolved on his Mother, who, we find, spared no Expence to furnish him with polite Literature. As his Father had left him a large, and well chosen Library, as soon as he was capable, by the Knowledge of *Latin* and *Greek*, he applied himself to the proper Use thereof, according to the several Classes of Poets, Orators, Historians, Civilians, Mathematicians, and Divines. He first discovered a Genius for Poetry, in which he was much assisted by a strong Memory: But this did not engross his Attention long; for, about the Age of Fifteen, he applied himself to the Study of Philosophy and the Mathematics, at the University of *Jena*; and, likewise, soon after that, at *Leipsic*, whither he returned in 1663, and the Year following was admitted Master of Arts.

He now applied his Mind, with great Assiduity, to the Study of the *Greek* Philosophers, and took much Pains to reconcile *Plato* and *Aristotle*; as he did, afterward, *Aristotle* with *Descartes*: But this, probably, proved a difficult, or unprofitable Undertaking; for he now entered upon the Study of the Law, and made it so much his sole, or principal Pursuit, and soon became so great a Proficient therein, that he was admitted Bachelor of Laws in 1665, and, the Year following, would have been advanced to the Degree of Doctor, had it not been refused on Account of his Youth, and it is said, had incurred the Displeasure of some of the College for rejecting the Principles of *Aristotle* and the Schoolmen.

In the Year 1667, he went to *Altorf*, where he maintained Three Theses in the Law, with such Applause, that he had the Degree of Doctor conferred on him, and was ordered a Professor-

ship extraordinary in Law, which latter he refused. — Thence he went to *Nuremberg*, in order to visit the learned Men there, and was introduced into a Society of Persons there engaged in the Pursuit of the Philosophers Stone: He was also admitted into their Laboratory, and desired to act as their Secretary, offering him a Pension; but this he declined.

About this Time, *Baron de Boinebourg*, first Minister of the Elector of *Mentz*, meeting Mr. *Leibnitz* at an Entertainment, conceived so high an Opinion of his Abilities, that he recommended to him to apply himself wholly to the Study of Law and History, and promised to engage the Elector, *John Philip de Schonborn*, to send for him to his Court. Upon this, Mr. *Leibnitz* removed to *Frankfort upon the Mein*, in the Neighbourhood of *Mentz*.

In 1668, he wrote a Treatise to induce the *Poles* to chuse the Elector Palatine their King; which so highly pleased the Elector, that he invited him to his Court: But he was prevented from accepting this Invitation by the Baron *Boinebourg* procuring the Elector of *Mentz*'s Delegation appointing him Councillor of the Chamber of Review in his Chancery, though he was then but 22 Years of Age.

In 1672, he went to *Paris* to manage some important Affairs of the Barons, and during his Stay there, he contracted such an Acquaintance with Gentlemen in the philosophical and mathematical Sciences, as led him more particularly to the Study of the Mathematics; and having observed some Defects in the arithmetical Machine of *Monsieur Pascal*, he invented a new one, the Design of which he explained to *Monsieur Colbert*, which was greatly approved of by him and the Academy of Sciences, who, as a Mark of their Esteem, offered him a Pension, and promised him other Advantages to reside there, and to commence a Member of that Society: But, as it would be necessary for this End to embrace the *Roman Catholic* Religion, and Mr. *Leibnitz* being firmly attached to the *Lutheran*, he absolutely refused all the Offers that were made him by that Society.

In 1673, upon the Death of the Baron *de Boinebourg*, he came over to *England*, where he became acquainted with Mr. *Oldenburg*,

burg, Secretary of the *Royal Society*, and Mr. *John Collins*, Fellow of that Society; and then he applied himself, with Vigour, to the Study of the Mathematics, (in which he acknowledges to have received great Assistance from the Writings of *Pascal*, *Gregory*, and *Huygens*) and took so much Pleasure in his Studies and Friends, as greatly contributed to fix his Residence in *England*.

But, soon after this, he received an Account of the Death of the Elector of *Mentz*, by which he lost his Pension. Upon this, he returned to *France*, whence he wrote a Letter to the Duke of *Brunswick Lunenburg*, to inform him of his Circumstances, who returned him a very kind Answer, and, as a Pledge of his Favour, appointed him Councillor of his Court, with a Stipend, and gave him Leave to continue at *Paris* till his arithmetical Machine should be completed.

In 1676, he returned again to *England*, and from thence went to *Holland*, in order to proceed to *Hanover*, where he proposed to settle: Upon his Arrival there, he applied himself to furnishing the Prince's Library with the best Books in the various Branches of Science and Literature. — The Duke of *Brunswick Lunenburg* dying in 1679, his Successor *Ernest Augustus*, then Bishop of *Osnabrug*, shewed our Author the same Favour as his Predecessor had done, and ordered him to write the History of the House of *Brunswick*. Mr. *Leibnitz* undertook it, and travelled over *Germany* and *Italy* in order to collect Materials, and returned to *Hanover* in 1690.

In 1700, he was admitted a Member of the *Royal Academy* of *Paris*. — The same Year, the Elector of *Brandenburg*, afterwards King of *Prussia*, founded an Academy at *Berlin*, under the Direction of Mr. *Leibnitz*, who was appointed perpetual President: And though his Affairs did not admit of his constant Residence there, he furnished their Memoirs with several curious Pieces in Geometry, Astronomy, and other Branches of polite Literature.

His Fame spread, about this Time, through all *Europe*, as a Philosopher, Lawyer, and Statesman: That besides the Office of Privy Councillor of Justice, which the Elector of *Hanover* had given him, the Emperor, upon the Recommendation of the

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the Duke of *Brunswick* in 1711, appointed him *Aulic* Counsellor; and the *Czar* made him Privy Counsellor of Justice, with a Pension of a thousand Ducats a Year, after but a few Hours Acquaintance, or Conversation with him, at *Torgaw*, at the Time of the Marriage of the Princess of *Wolfenbottle* with the Son of that Prince.

Upon his Return to *Hanover* in 1714, he found that the Elector, who was then raised to the Throne of *Great Britain*, had appointed Mr. *Echard* for his Colleague in Writing the History of *Brunswick*, the Prosecution of which had been interrupted by many occasional Peices, and some incidental Controversies.

The most considerable of which, antecedent to this Time, was concerning the Invention of a new Method of *Fluxions*, which he claimed as his own, though he received the first Hints thereof from Sir *Isaac Newton's* Letters. The Method of *Fluxions*, as Sir *Isaac* styles it, and other *English* Mathematicians after him, is the same Method of Analysis as what Mr. *Leibnitz* calls *Calculus Differentialis* (in which he has been followed by most of the Mathematicians abroad.) This Invention gave Occasion to a Paper Dispute, first between Mr. *Keill* and Mr. *Leibnitz*, and afterwards between Sir *Isaac* and Mr. *Leibnitz*, in which, the Difference betwixt Sir *Isaac's* Method of *Fluxions* and Mr. *Leibnitz's* is so small and trivial, that our *English* Mathematicians have given the Credit of it to Sir *Isaac*. The Substance of what passed *Pro* and *Con* may be seen in the *General Dictionary*, to which we refer the Reader; but more particularly in a small Treatise entitled, *Commercium Epistolicum*, published by Order of the *Royal Society of London*.

About the latter End of the Year 1714, our Author returned again to *England*, when he received some farther Marks of Friendship from the Elector of *Hanover*, then his *Britannic* Majesty, and was frequently at Court: But he had not been in *England* long before he engaged in a Dispute with Dr. *Samuel Clarke*, relating to the Principles of natural Philosophy and Religion. This was conducted with much Candor and Learning; and those Papers, which are published by Dr. *Clarke*, will ever be esteemed by Persons of Genius, Learning, and Penetration, on these Subjects: But Mr. *Leibnitz's* Death terminated those Dis-

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The Life of G. W. D. LEIBNITZ. 389

putes, probably, much sooner than otherwise, he dying Nov. 14, 1716, in the 70th Year of his Age, of the Gout and Stone.

His distinguished Character for Learning, great natural Abilities, and polite Address, were such Qualifications as gave him Admission and Favour at several Courts of *Europe*. As he was not insensible of the Honour of being considered as one of the greatest Men of the Age, so he was always solicitous to procure and continue the Favour of Princes, which, how much soever it may favour of Vanity, he laudably made use of that Advantage for the Promotion of Learning, as well as his personal Interest; for he was very fond of Money, and amassed together several thousand Pounds. He never was married, though he made Courtship when he was about 50 to a Gentlewoman, who, it is said, desired Time to consider of it: Mr. *Leibnitz* had thereby an Opportunity to do the same, which was all the rest of his Life. This neglect of Marriage, without any real Aversion to it, was greatly wondered at by some of his Friends, who knew he was naturally of a warm Temper, and had a natural Son in his Youth, whom he took Care to have educated, and afterward was his Companion and Confident during his Life. It is likewise observed, that the natural Warmth of his Temper subjected him to many of those Disputes which he began and supported in the Course of his Life, never giving up a Point of which he was not fully convinced, and too apt to triumph over his Adversary where he had, as he apprehended, any Advantage.

—— This Attachment to his favourite Sentiments, and his general Knowledge of Science, led him too often to think himself Master of many Subjects which he had but superficially considered, and thereby lose himself in the Intricacy, and suffer in his Reputation. This is spoken principally with regard to some Reflections our Author made on Mr. *Lock's Essay on Human Understanding*, which occasioned Mr. *William Molyneux*, in a Letter to Mr. *Locke*, to write thus: “ Mr. *Leibnitz* is certainly an extraordinary Person, especially in Mathematics; but, really, to speak freely of him, in Relation to his Reflections on your *Essays on Human Understanding*, I do not expect any great Matters from him; for methinks (with all Deference to his great Name) he has given the World no extraordinary Samples of his

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Thoughts that Way." In answer to which, Mr. *Locke* observes, that even great Parts will not master any Subject without great thinking. — In the Profession of Religion, he was a *Lutheran*, but held many Sentiments that did not consist with any established Form, and thought indifferently of the Priest; for he seldom or never attended the public Service of the Church, and refused the Attendance of a Minister in his last Illness.

He was of a moderate Stature and thin in Body, using much Study and Temperance, which contributed to the Strength of his intellectual Faculties; for, it is said, he could repeat *Virgil* by Heart.

His Writings were equally numerous and voluminous: But as they were on all Kind of Subjects indiscriminately, and in no particular, or systematic Order, especially in Mathematics and Philosophy, we cannot here propose to trouble the Reader with a tedious Catalogue of such detached Pieces, Letters, Memorials, &c. which may be seen at large in the *general Biographical Dictionary*, and most of his mathematical Memoirs in the *Acta Eruditorum*, &c.

The LIFE of JOHN LOCKE.

JOHAN LOCKE, a celebrated Politician, and Metaphysician, rather than a Philosopher, descended from a genteel Family in *Somersetshire*, being born at *Wrington* in 1632: He had an early and liberal Education, first in the Grammar-school at *Westminster*, and afterwards at *Christ's Church* in *Oxford*, where he made a very distinguishing Progress in Learning, took his Degree in Arts at the earliest Periods, and entered more particularly on the Study of Physic with greater Application than was consistent with his Health, and therefore, on the Advice of Friends, he declined it, and accepted an Offer made him, of going Abroad as Secretary to Sir *William Swan*, who was Envoy to the Elector of *Brandenburg* and other German Princes: But this Employ continuing but one Year, he returned again to his Studies at *Oxford*, and gave some remarkable Instances of his Skill in this Science.

In 1669, he attended the Countess of *Northumberland* into *France*, with her Husband; but the Earl dying at *Turin*, Mr. *Locke* soon returned with her Ladyship to *England*. He then resided at Lord *Ashley's*, but, occasionally, gave such Hints of a Latitude in Sentiments respecting Religion as was not then generally approved; — he was very early disgusted with the Method of *Aristotle*, and the common Systems of Logic and Metaphysics used in the Schools, and much averse to the scholastic Disputations: He resolved to attempt something that Way, and formed the Plan for his Essay on *Human Understanding*, which he prosecuted with all the Dispatch his other Affairs permitted. He was still properly in the Service of his Patron, who, being created Earl of *Shaftsbury*, and Lord Chancellor the following Year, engaged Mr. *Locke* as his Secretary. He held this Place till *November*, 1673, when he had a Commission from the Board of Works, and 500*l.* per Ann. But this terminated the very next Year; for the Commission granted to the Board itself was dissolved.

In 1674, he again returned to his Studies at *Oxford*, and took the Bachelors Degree in *Physic*; but his Studies were interrupted by an Indisposition tending to a Consumption, and he went to *France* the next Summer for his Health. His Thoughts were, however, employed on the Subjects of his Essay, which he communicated to Lord *Herbert*, and received no small Encouragement in the intended Work: But did not neglect his Attention to the Science of *Physic*, and was much esteemed by that Faculty, especially Dr. *Sydenham* and Dr. *Mapletoft*, with whom he held a Correspondence during his Residence at *Montpellier*.

The Earl of *Shaftsbury* being restored to Favour at Court in 1679, Mr. *Locke* was sent for to be his Secretary, when his Lordship was made President of Sir *William Temple's* Council; but being disgraced and imprisoned in less than half a Year, he fled into *Holland*, where our Author thought proper to follow him for his own Safety, as he had the Measures of the Government at that Time; and, as he steadily adhered to Revolution Principles, he was obliged to remain Abroad, as it were, concealed, which was probably no small Disadvantage to him in respect to Riches; but it gave him an Opportunity for Writing

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on a Variety of Subjects, which he did with such Strength, Justness of Sentiment, and of Reasoning, as will ever be esteemed by the Friends of Truth and Liberty.

Soon after his Return to *England*, which was (in the Fleet which convoyed the Prince of *Orange*) in *February*, 1689, he was made Commissioner of Appeals, which was 200*l.* *per Ann.* and was offered to go Abroad in Character of Envoy to the Court of the Emperor, or to the Elector of *Brandenburg*, but he declined both, and accepted the Invitations he received to reside at Sir *Francis Marsham's* at *Oates* in *Essex*, where, besides the Agreeableness of the Seat and the Benefit accruing to his Health, he found, in Lady *Marsham*, a Friend and Companion exactly to his Wish: A Lady of contemplative and studious Complexion, and innured to deep and refined Speculations, which contributed to animate our Author in a further Exertion of his Talents on many interesting and important Subjects: Here we find him writing in Defence of the Revolution, — and in attempting to ascertain the Standard of the *English* Coin.

In 1695, he was appointed Commissioner of Trade and Plantations, which much engaged him for about three Years in the Affairs of State; after which he returned to *Oates*, the fore-mentioned Seat of Lady *Marsham*, and there continued to the End of his Life. He was very sensible of his Dissolution, and always spoke of it with great Composure. He expired on the 28th of *October*, 1704, in the 73d Year of his Age. His Body was interred in the Church at *Oates*. For a Catalogue of his many and valuable Works, on a Variety of Subjects, chiefly political and mechanical, besides a small Treatise on the *Newtonian* Philosophy, we may refer the Curious to the *new general Biographical Dictionary*.

His Character has been often attempted, particularly by Mr. *Peter Coste*, his Companion and Amanuensis: But the highest Elogium upon him was certainly that of the late Queen *Caroline*, who erected a Pavillion in *Richmond Park* in Honour of Philosophy, where she placed our Author's Bust on a Level with *Bacon*, *Newton*, and *Clarke*, as the four principal *English Virtuosi*. — But this Parallel will not meet with much Approbation from those who best understand Nature and Science.

The LIFE of the Hon. ROBERT BOYLE, Esq;

ROBERT BOYLE, one of the greatest experimental Philosophers as well as the best of Men, was born at *Lismore*, in the Province of *Munster* in *Ireland*, upon the 25th of *January*, 1626-7, his Father was *Richard*, Earl of *Cork*, being his seventh Son and the fourteenth Child, by one of the most accomplished Women, who dying when this Son was scarce three Years old, the Care of his infant Years devolved on the Father, who was not wanting in the Care of his Constitution nor Education. He had so great Aversion to the ill judged Fondness of some Parents, who will scarce let the Sun shine, or the Wind blow upon their Children, that he committed him to the Care of a Nurse in the Country, with Orders to bring him up hardy; and this probably contributed to his being of a strong and vigorous Constitution. When he had passed through the necessary Rudiments of School-learning in that Country, in the Year 1635, his Father sent him to *England*, in order to be educated at *Eaton* under Sir *Henry Wotton*, an intimate Acquaintance of his Father's. Here he soon discovered a Force of Understanding, and such a Disposition to improve and cultivate it, as gave great Hopes of his future Eminence: Here he continued for three Years, when his Father carried him to his own Seat at *Stalbridge*, where he remained some Time under the Care of one of his Chaplains.

—— Here he wrote some Memoirs of his early Years, in which he discovered a very serious Turn of Mind, as he first, and very minutely, relates various remarkable Instances of divine Goodness, in his many signal Escapes from eminent Danger of his Life; whereby he was probably led, or determined upon devoting himself to the Study of Religion in its genuine Principles and Practices, particularly to the Study of the Holy Scriptures in their original Languages. For these Purposes, about the Year 1640, he went to the University of *Leyden* in *Holland*, where he received his academical Education, and afterwards travelled into *France*, *Switzerland*, and *Italy*, where he made such considerable Improvements in the oriental Languages (which he continued for many Years afterwards) that Bishop

Burnet took Notice, in his funeral Discourse upon him, that he could have quoted all the remarkable Passages of the *Old Testament* very readily in the *Hebrew*, or those of the *New Testament* in *Greek*.

Upon his Return from his Travels, about the Year 1655, he settled in the University of *Oxford*, where he prosecuted his Studies with great Vigour, especially those of experimental Philosophy and Chymistry, in which he spent a considerable Sum of Money, entertaining Operators to work in the Laboratory, which he had built for his own Use. — Here he read the Philosophy of *Aristotle* and *Des Cartes*, with a Criticism and Attention that enabled him to form right Judgment with respect thereto; And finding their Account of Things were founded chiefly on Conjecture and mere Hypothesis, he saw the greater Expediency and Advantages of Philosophy founded on Experiments, and therefore proceeded with great Steadiness on those Principles which were more certain and demonstrable.

He frequented, likewise, the Society of the *Virtuosi*, who met in the Apartment of Dr. *Wilkins*, Warden of *Wadham College* (which they stiled the philosophical College): Here many united with him in the Improvement of experimental Philosophy, among whom were Dr. *Seth Ward*, Dr. *Wilkins*, Dr. *Bathurst*, Mr. *Christopher Wren*, Mr. *Rook*, and several others. For some Time they were not under the Regulations and Orders of a Body corporate, but communicated to each other their Sentiments, with great Freedom, which they either had or apprehended might be confirmed by Example: This they continued till the latter End of the Year 1658, when many of them removed from *Oxford*; and the greater Part coming to *London*, they usually met at *Gresham College*, and united, with many other learned and ingenious Gentlemen, in their Improvements of the true Principles of Philosophy by Experiments.

In the Year 1657, our Author communicated several Experiments on the AIR PUMP, which was in some Measure his own Invention, and perfected by that ingenious Philosopher Mr. *Hook*. By this Means he discovered and demonstrated several Qualities of the Air, so as to lay a Foundation for a compleat Theory; whereby his Improvements became very

considerable, and his Character, on this Account, highly esteemed by those who knew him.

About this Time the famous Dr. *Wallis*, so distinguished for his Philosophical and Mathematical Learning, did him the Honour to dedicate to him his excellent Treatise on the *Cycloid*, and Dr. *Nathaniel Highmore*, a very eminent Physician, dedicated a Book to him under the Title of *The History of Generation*.

Not long after the Restoration of King *Charles II.* when the Royal Society was incorporated, he was one of the first Members of it, and appointed one of the Council to it, and afterwards President; where he distinguished himself, as Mr. *Wood* observes, as the greatest Promoter of the New Philosophy (as it was then called) of any amongst his Contemporaries: And for this Purpose, he maintained a Correspondence with several Proficients in these Sciences, particularly Sir *Isaac Newton*.

He took great Pains to acquire a proper and certain Knowledge of the various Properties of natural Bodies, and communicated the Result of his Enquiries, when it might be done with Satisfaction and Usefulness. Some of these were the following:——That the Matter of all natural Bodies is the same, *viz.* an extended, divisible, impenetrable Substance:——That the Principles of natural Bodies depend partly on the Influence of external Objects, as well as the primary Affections of Matter:——He likewise investigated the Nature of Fluids,——the great Effects of unheeded and languid Motion,——the Nature of Heat and Cold,——and the final Causes of natural Things.——He likewise invented, or improved an Instrument for estimating the Difference of Metals; ——explained an Instrument, called the *Statical Hygroscope*, to shew the different Variations of Weather, and the Description of a Cord Hygrometer; ——made many curious Discoveries with Respect to the Air; ——the Nature of the human Blood; ——exhibited many Experiments to prove the Properties of Mineral Waters, and for making salt Water sweet; and used a Variety of Methods to improve the Knowledge of the *Materia Medica*.——He searched into the Origin and Virtue of Gems; ——the determinate Nature of

Effluvia, their Subtlety and Efficacy; — the Incalescence of Gold and Mercury; — the Causes of Attraction and Suction; — and the Nature of Electricity. — He likewise studied and shewed the Use of specific Medicines, with its Reconciliableness to the corpuscular Philosophy, and the Advantages and Use of simple Medicines. — He likewise made many elaborate Processes in Chymistry, which he collected together and left, as a Kind of hermetic Legacy, to the studious Disciples of that Art. — Dr. *Boerhaave* therefore said of him, “ To him we owe the Secrets of Fire, Air, Water, Animals, Vegetables, and Fossils: So that from his Works may be deduced, the whole System of natural Knowledge.

But Philosophy and Enquiries into Nature, though they engaged his Attention deeply, did not engross it intirely, since we find that he still continued to pursue critical and theological Studies: In these he had the Assistance of some great Men, particularly Dr. *Edward Pococke*, Mr. *Thomas Hyde*, and Mr. *Samuel Clarke*, all of great Eminence for their Skill in the oriental Languages. He had also a strict Intimacy with Dr. *Thomas Barlow*, at that Time Keeper of the *Bodleian* Library, and afterwards Bishop of *Lincoln*.

About the Year 1663, Mr. *Boyle* received some Marks of the Royal Favour, and was treated with much Civility and Respect by the two great Ministers, the Lord Treasurer *Southampton* and Lord Chancellor *Clarendon*. He was solicited by the latter to enter into Holy Orders, not only out of Regard to him and his Family, but chiefly with a View to serve the Church itself, my Lord *Clarendon* declaring, that his unblemished Life and distinguished Learning would do Honour to any ecclesiastical Preferments he might attain. — Mr. *Boyle* considered all this with due Attention, but, to ballance these, he reflected, that, in the Situation of Life he was in, whatever he wrote in support of Religion would have as great Weight as if he was in the Character of a Clegyman: — That he needed no Accessions with respect to Fortune, nor indeed any eager Appetite for greater; but, above all, according to his wanted Modesty, he frankly declared, that he had not felt any Motion or Tendency of Mind which he could safely esteem a Call from the Holy Ghost; and so not venturing to take Holy Orders lest he should be found to have lied
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into it. He chose therefore to pursue his philosophical Studies in such a Manner as might be most effectual for the Support of Religion, and began to communicate to the World the Fruits of those Studies.

He was constant to the established Church, an Enemy to Persecution in Matters of Conscience, and averse to all contracted Notions of Religion. He had possessed himself of such an amiable View of Christianity, separated from either superstitious Practices, or the Sourness of Parties: He considered it as a System of Truths, which ought to purify the Hearts and govern the Lives of those who profess it: He loved no Practice which seemed to lessen that, nor any Niceties which occasioned Divisions among Christians. He loved no narrow Thoughts, nor superstitious Opinions in Religion; and therefore, as he did not shut himself within a Party, so neither did he shut any Party out from him. He had a particular Aversion to all those Opinions and Practices which seemed, to him, to destroy Morality and Charity. Severities and Persecution upon the Account of Religion, he looked upon as directly opposite to the Spirit of it. He was extremely candid and courteous, and free of Access even to Strangers and Foreigners. — His Laboratory was constantly open to the Curious, whom he permitted to most of his Processes. — He was plain, unaffected, and temperate in his Life, and bore all his Infirmities and Pains with the Decency and Submission that became a Christian and a Philosopher; and whatever he was in the Sight of Men, how pure and spotless soever his Character appeared to the World, he was, in Reality, the same in his most secret Recesses. He allowed himself a great deal of decent Chearfulness, having nothing of that Moroseness which some Philosophers have been chargeable with, nor of that Affectation which Men of extraordinary Piety often run into without being well aware of. — His Charity and Generosity were the most exemplary imaginable, great Sums were readily parted with by him without the Partialities of Sect, Country, or Relations. This may be evidenced, in a Variety of Instances, as the general Tenour of his Conduct. — He spoke of the Government, even in Times which he disliked, and upon Occasions which he spared not to condemn, with a remarkable Exactness. King *Charles the Second*, King *James*, and King
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William were so highly pleased with his Conversation, that they used to converse with him with great Familiarity. — His four elder Brothers being all Noblemen, he was several Times offered a Peerage, which he constantly refused to accept ; but he procured a Title, which without derogating from the Dignity of Kings, must be acknowledged beyond their Prerogative to confer. He had too unblemished a Candour to be capable of those little Arts and Practices which the World generally term *Wisdom*. He could neither lie nor equivocate, but could be silent, and by practising that with Prudence and Discretion he recovered himself upon many uneasy Occasions. He made true Judgment of Men and Things, and his Advices were solid and rational ; and if Caution and Modesty gave too strong a Bias, his Invention was fruitful to suggest good Expedients. He entertained a very high Opinion of the Dignity of human Nature, and of the great Improvements Man is capable of : But was surprized, to see how little the Generality, even of the more polite Part, were influenced by manly Principles and rational Motives. He very early perceived that the Affairs and Favours of Courts were very precarious, and therefore withdrew himself from the flattering Temptations of it, at a Time, says Dr. *Burnet*, when he was treated with Marks of Distinction. He had the Principles of an *Englishman* as well as of a Protestant, too deep in him to be corrupted or cheated out of them ; and in these he studied to fortify all that conversed with him. “ He had a prodigious extensive, as well as accurate Knowledge, and carried the Study of the *Hebrew* Language very far into the rabinical Writings and the other oriental Languages. He had read so much of the Fathers as to form a clear Judgment of all the eminent Ones. He had studied the Scriptures with great Assiduity, and had gone with great Attention thro’ the controversial Parts of Religion, so as to be Master of the whole Body of Divinity. — He run thro’ the whole Compass of the mathematical Sciences, and tho’ he did not set himself, says Bishop *Burnet*, to spring new Game, yet he knew even the abstrusest Parts of Geometry. — Geography, in the several Parts of it which related to Navigation or Travelling, and Books of Travels, were his Diversion. — He went very accurately thro’ all the Parts of Physic, only the Tenderness of his Nature made him less ltable to endure the Exactness of anatomical Dissections,

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especially of living Animals, though he knew these to be most instructing. But, for the History of Nature, ancient and modern, of the Productions of all Countries, of the Virtues and Improvements of Plants, of Ores and Minerals, and all the Varieties that are in them, in different Climates, he was by much, says the Writer last quoted, the Readiest and most Perfect that I ever knew, in the greatest Compass and with the truest Exactness. This put him in the Way of making all that vast Variety of Experiments, beyond any Man, for what we know, that ever lived. And in these, as he made a great Progress in new Discoveries, so he used so nice a Strictness and delivered them with so scrupulous a Truth, that all who have examined them have found how safely the World may depend upon them. But his peculiar and favourite Study was Chymistry, in which he engaged with none of those sinister and ambitious Designs that drew many into them. His Designs was only to find out Nature, to see into what Principles things might be resolved, and of what they were compounded, and to prepare good Medicaments for the Bodies of Men. He made Chymistry a Charity to others, as well as an Entertainment to himself; employing his Sister, and others, in distributing his Preparations wherever they might be serviceable. Bishop Burnet sums up his Character in these Words: "He, who laboured most, at the greatest Expence, and with the most Success, at Experiments, was *Robert Boyle*, the Earl of *Cork*'s youngest Son; he was looked upon by all that knew him, as a most amiable Patron, worthy of Imitation; and as a devout Christian, humble and modest, unblemished through Life, who delighted in nothing so much as in doing Good, mortified to the World, and living abstracted from mere sensual Pleasures and worldly Interest." His Health, in the latter Part of his Life, was tender, and frequently interrupted; yet, by observing an exact Regimen of Diet, and never indulging an Excess, he attained to the sixty-fourth Year of his Age, and retained his Sight to the last. The Picture of him, which is prefixed to many of his Works, is extremely like him. He died *December 30, 1691*, and was interred in *St. Martin's* in the Fields; his funeral Sermon was preached by *Dr. Gilbert Burnet*, Bishop of *Salisbury*, on *Eccles. ii. 26. For God giveth to a Man, that is good in his Sight, Wisdom, Knowledge, and*

Joy;

Joy; a great Number of Elogies and Epitaphs upon him were soon after published. These are generally carried to too great a Length, as no Man is infallible, but there were in some particular Acts of his Life, such ample Proofs of his moral and religious Character, as well as his philosophical, that it is really no less than an Act of Justice to mention some of them, viz. — His conferring on Dr. *Saunderson* an honorary stipend, of 50*l.* a Year, for his singular Learning and Piety; when, by his Attachment to the Royal Party (which our Author did not espouse) he had lost all his Preferments, and was reduced to very unhappy Circumstances. — He had very much at Heart the Care of Clergymen's Widows and their Children; as also the augmenting the Salaries of such as could not well subsist on their Livings. These Ways he disbursed more than 1000*l.* per Ann. — About the Year 1682, he appropriated a very considerable Sum for the Propagation of the Gospel amongst the *Indians*, and was at the Charge of the Translation, and an Impression of the *New Testament* in the *Malayan* Tongue, which he sent over all the *East-Indies*. — He bestowed a noble Gratuity on the Translator of *Grotius* on the Truth of the *Christian* Religion into *Arabic*, and dispersed an Impression into those Countries where it was understood: — Gave 700*l.* to the Edition of the *Irish* Bible; and contributed a like Sum to an Impression of the Bible in the *Turkish* Language. — And he purchased many Books for the Promotion of Truth and Religion throughout *Great-Britain*. And lastly, in Honour and Defence of the *Christian* Religion, founded a Lecture, for ever, with a handsome Salary. So that we may, with great Propriety, apply to him that commendous and genuine Character given of him by Dr. *Shaw*, viz. — “He had a true philosophical Mind, well seasoned with Humanity, Beneficence, and Goodness. After he had led us through all the Regions of Nature, considered her various Productions, shewed us the Uses and the Manner of converting them to our several Purposes, convinced us that we live in a World most wisely contrived, wherein numberless grand Designs are at once carried on with unceasing Variety, and manifested that all the Beings, and all the Bodies we know, jointly conspire as one whole, in bringing about the great Ends of Nature, he bids us not stop here, but leaves us full
of

The Life of the Hon. ROB. BOYLE, Esq; 401

of Assurance, that the farther we enquire into the Works of the universal Architect, the more Beauty and Harmony, and the greater Use and Satisfaction we shall find among them, and this as long as the Frame of the World endures. These noble, manly, and religious Sentiments are what the Reader will find inculcated through most of the philosophical and theological Works of Mr. Boyle, whose principal Aim and great Delight it was to benefit Mankind. His great Abilities in philosophical Knowledge may, in Part, be judged of from the Elogiums bestowed on him by many, at that Time distinguished for their Learning, as Dr. Shaw, before mentioned, Dr. Robert Plott, Dr. Herman Boerhaave, Mr. Bolton, Mr. Budgell, Dr. Halley, Dr. Wotton, Mr. Joseph Glanville, Francesco Redi, and others; but more fully from his Works; these were, indeed, very numerous, some on theological and chemical, but principally on philosophical Subjects, in all *Sixty-three*; besides several Letters published in the *Philosophical Transactions*; of which a Catalogue is given, with their Editions and Translations, and Extracts from sundry of them, by way of Note, at the Close of his Life, in the *General Biographical Dictionary*, to which we shall refer the Curious, having already hinted at many of the principal Subjects of his Investigation, and presuming a farther Detail of them would be thought unentertaining to our Readers. We shall, however, insert the Character given of his Works by Mr. Joseph Glanville: He says, “His Works are sufficient to oblige all Mankind, and to erect an eternal Monument to his Memory. In his Works you will find the greatest Strength of Reasoning, and gentlest Smoothness; the most generous Knowledge, and the sweetest Modesty; the noblest Discoveries, and the sincerest Relations; the greatest Self-denial, and universal Love to Men; the profoundest Insight into Philosophy and Nature, and the most devout affectionate Sense of God and Religion.”

As to the Person of this great Man, we are told, that he was tall, but slender; and his Countenance pale and emaciated; his Constitution tender and delicate, and was therefore very careful to observe and regulate himself, according to the Changes of the Weather by his Thermometer.

Mr. Boyle was never married, but we are credibly informed, he courted the ingenious and beautiful Daughter of Cary, Earl of

Monmouth, and that to this Passion was owing his seraphic Love. He afterwards abstained from Marriage, from Political, or Philosophical Motives.

It is much admired by many, that Mr. *Boyle* was never made a Peer; but this was not owing to a want of Opportunity, but his Choice of a more private Character and Station, to devote his Life to those Studies which were the Honour and the Happiness of his Life.

The LIFE of JOHN NEWTON.

JOHN NEWTON, an eminent *English* Mathematician, was the Grandson of *John Newton* of *Axmouth* in *Devonshire*, and Son of *Humphrey Newton* of *Oundle* in *Northamptonshire*, where he was born in 1622: After he had received the proper Rudiments of a grammatical Education, he was sent to *Oxford*, and commenced Commoner of *St. Edmund's-Hall* in 1637. He took the Degree of Batchelor of Arts in 1641, and his distinguishing Talents were so conspicuous in the great Branches of Literature, that he was created Master of that Faculty the Year following, in Precedence to many other Students of Quality. At this Time, his Genius leading him principally to the Study of Astronomy and the Mathematics, he applied himself diligently to those Sciences, and made a great Proficiency in them, insomuch that he was able to write with great Skill and Accuracy on several important Branches thereof: But these did not engross all his Time and Study, theological Subjects were likewise attended to, so as to qualify him for those high Preferments in the Church which he soon after enjoyed; for immediately upon the Restoration of King *Charles II.* he was created Doctor of Divinity at *Oxford*, made one of the King's Chaplains, and Rector of *Ross* in *Herefordshire*, in the Place of Mr. *John Toombs*, who was ejected for Nonconformity, which Living he held till his Death, which happened at *Ross* on *Christmas-Day*, 1678. We meet with no other remarkable Memoirs of his Life. His Writings are a

Proof

The Life of FRANCIS BLONDEL. 403

Proof of his great Application to Study, and a sufficient Monument of his Genius and Skill in the Mathematics : These are the principal, *viz.*

- I. *Astronomia Britannica*, in three Parts, 4to.
 - II. Tables of Declination, Ascension, &c. for calculations.
 - III. *Trigonometria Britannica*. Folio.
 - IV. *Chiliades centum Logarithmorum*.
 - V. Geometrical Trigonometry.
 - VI. Mathematical Elements.
 - VII. A perpetual Diary.
 - VIII. A Treatise on Gauging.
 - IX. An Introduction to Astronomy.
 - X. An Introduction to Geography : With ten other Tracts relative to those Sciences.
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The LIFE of FRANCIS BLONDEL.

FRANCIS BLONDEL, a Native of *France*, was born about the Year 1630 ; but Historians do not inform us precisely of the Time or Place : He was a Person of a distinguished Genius, and having improved the Advantages of an early liberal Education, he made such considerable Improvement in the mathematical Studies that he was chosen *Regius Professor* of Mathematics at *Paris*, when he was about twenty-one Years of Age. He was afterwards appointed Governor to *Lewis Henry de Lomenie*, Count *de Brienne*, whom he accompanied in his Travels from *July* 1652, to *November* 1655, an Account of which were published twice in 1660 and 1662. The Skill he acquired in his Profession introduced him into several honourable Employments in civil Affairs : He was also intrusted with the Management of some Negotiations with foreign Princes, and, at Length, arrived to the Dignity of Councillor of State : He had likewise the Honour to be mathematical Preceptor to the Dauphin. It was he who drew

the Design of the new Gates at *Paris*, after the *Dutch* War in 1672. He likewise wrote some of the Inscriptions; for he was no less versed in the Knowledge of the *Belles Lettres* than in that of Geometry, as may be seen by the Comparison he published between *Pindar* and *Horace*. He was afterward chosen Director of the Academy of Architecture, and a Member of the *Royal Academy of Sciences*, in all which he acquitted himself with Dignity and Applause, and died *February* 1st, 1686. He published a Variety of Books, but principally the following.

- I. Some Notes on the Architecture of *Savoy*.
- II. A Course of Architecture, in three Volume, Folio.
- III. A Course of Mathematics.
- IV. The History of the *Roman Calendar*.
- V. The Art of throwing Bombs.
- VI. A new Manner of fortifying Places, &c.

The LIFE of BLAISE PASCAL.

BLAISE PASCAL, an eminent Mathematician of *France*, was born at *Clermont* in *Auvergne* the 19th of *June*, 1623: He descended from an ancient and honourable Family; his Father was *Stephen Pascal*, President of the Court of Aids, a learned Man, and an able Mathematician; who having an extraordinary Tenderness for his Son, and perceiving a remarkable Genius in him, quitted his Office in the Province, went and settled at *Paris*, and attended entirely to the Education of his Son. Prepared by a tractable Disposition, he imbibed Instruction with a remarkable Eagerness and Improvement: His Genius was plainly bent to the Mathematics: but this his Father cautiously kept him from, that he might not be hindered from other Branches of Learning, which he thought proper to precede it. However, at Length he found Means to investigate some mathematical Theorems that was thought beyond the Power of mere natural Capacity; from which Time his Father permitted, and assis-

ted his Studies in this Science. He no sooner viewed *Euclid's Elements* than he understood them.——When he was but sixteen Years of Age, he wrote a Treatise of conic Sections, which was counted, by the most Learned, a mighty Effort of Genius: And therefore it is no Wonder that *Des Cartes*, who had been in *Holland* a long Time, should, upon reading of it, chuse to believe that Mr. *Pascal* the Father was the real Author of it.——At nineteen Years of Age, he contrived an admirable artificial Machine, which was, at that Time, thought not to be equalled: And at twenty-three, having seen the *Torricellian* Experiment, he invented and tried a great Number of other Experiments. But our Author had not persisted very long in those dry and difficult Studies, before his Mind took a new Turn, and he forsook philosophical Disquisitions for a Variety of other incidental Amusements, which, however they might serve to shew his Wit, detracted from his Character in other Respects. Theology seemed at first the favourite Topic, and he was esteemed for some Time a devout Christian as well as a Student in that Profession; he is even said to give himself up to Prayer and Mortification, and carried his Religion to mere superstitious Observances. But, as abstracted as he appeared to be from the World, he could not forbear paying some Attention to what was doing in it; and he even interested himself in the Contest between the Jesuits and Jansenists: That he wrote some Pieces on that Occasion, the most remarkable were his *Provinciales Lettres*. These Letters, says *Voltaire*, may be considered as the Model of Eloquence and Humour, equal to *Moliere* or *Bossuet*. These Letters were intended to prove that the Jesuits had formed a Design to corrupt Mankind; and, for this Purpose, he selects some Characters among the *Spanish* and *Flemish* Jesuits, as the Support of his Satyrs; so that *Voltaire* calls *Pascal* the first of Satyrists. Another Character given of the Letters and the Author is, that though there is very little of the serious Turn, or a Concern discovered for serious practical Religion in them, the Author did not degenerate into a Licentiousness of Conduct, which is too often the Case of those who are superstitious Zealots for Religion at one Time, and afterwards discover and expose the Ignorance, Artifice, Intrigues, and Impositions of Priests. These Letters have

have been translated into a Variety of Languages, and though they received some Answers, they have nevertheless been deemed founded on too much Truth to be evaded. Mr. *Pascal* died at *Paris*, *August* 19, 1662, aged 39 Years. After his Death it appeared, that he had wrote some MSS. for the Press, viz. On the Equilibrium of Fluids; and another on the Weight of the Air, and other Miscellaneous Pieces: but we do not know they were ever published.

The Life of Sir WILLIAM PETTY.

SIR *William Petty*, a singular Instance of a universal practical Genius, was the elder Son of *Anthony Petty*, a Clothier at *Rumsey* in *Hampshire*, where he was born, *May* 16, 1623: It is hard to determine whether his Education was directed more by his Father, or himself; for being carried by his Father, when he was very young, to view the common Mechanics at Work, he presently took up the Tools and handled them with so much Dexterity, that he was encouraged to try his Genius in Mechanics very young, and at twelve Years of Age had attained to such uncommon Skill in several mechanical Branches of Trade, as to equal most common Workmen. After this he went to the Grammar School at *Rumsey*, where, if we may believe his own Account, in three Years Time he not only acquired a competent Readiness in the *Latin*, *Greek*, and *French* Tongues, but also of all the Rules of common Arithmetic, of practical Geometry, Dialling, and the astronomical Part of Navigation: Thus instructed in Literature and the Knowledge of several mechanical Trades, he removed at the Age of Fifteen to the University of *Caen* in *Normandy*, where he tarried about two Years: He returns again to *England*, and was preferred to some Office in the Navy: But having acquired about Sixty Pounds, he resolves upon making use of it for his farther Improvement in Science: ——— He turned his Thoughts now to the Study of Physic and Anatomy; and, to acquire Proficiency therein, in 1643 he visited *Leyden*, *Utrecht*, *Amsterdam*, and *Paris*, and

continued in foreign Parts three Years. ——— In 1647 he returned to *England*, and having invented an Instrument for double Writing, he obtained a Patent from the Parliament for teaching that Art for seventeen Years. Though this Project, however promising in the Theory, did not turn to any good Account; yet, by this Means, our Author became known to many leading Men of those Times: And residing for a little Time at *Oxford*, and observing their Proceedings in the University, he resolved, if possible, to get himself fixed there. Accordingly he wrote to Mr. *Hartslip*, recommending the Advancement of Learning, and intimating what Improvements he had then made in some Parts thereof, he was sent for to *Oxford*, and introduced at first as Assistant to the Professorship of Anatomy: In the mean Time, he practised Chemistry and Physic with good Success, and grew into such Repute that the philosophical Meetings, which preceded the *Royal Society*, were first held at his House; and soon after, by a parliamentary Recommendation, he was put into a Fellowship at *Brazen Nose College*, in the Place of one of the ejected Fellows, and created Doctor of Physic, *March 7, 1649*, and was admitted a Candidate of the College of Physicians on the 25th of *June 1650*; and upon the Resignation of Dr. *Clayton* he succeeded him in the Professorship of Anatomy, *January 1, following*, and was chosen Music Professor at *Gresham College* on the 7th of the ensuing Month. ——— In 1652 he was appointed Physician to the Army in *Ireland*, with a Salary of twenty Shillings *per Diem*: He was likewise Physician to three Lord Lieutenants successively, *Lambert, Fleetwood, and Henry Cromwell*. ——— After the Rebellion in *Ireland*, he was appointed one of the Commissioners for dividing the forfeited Lands to the Army who suppressed it. ——— When *Henry Cromwell* obtained the Lieutenancy of that Kingdom, in 1655, he made the Doctor his Secretary, and appointed him Clerk of the Council: He likewise procured him to be elected a Burgess for *West-Loo* in *Cornwall* in *Richard Cromwell's* Parliament, which met in *January, 1658*: But, upon the 25th of *March* following, Sir *Hierom Sankey*, Member for *Woodstock* in *Oxfordshire*, impeached him of high Crimes and Misdemeanors in the Execution of his Office. This occasioned a great deal of Trouble to the Doctor,

tor, as he was summoned before the House of Commons; but notwithstanding the assiduous Endeavours of his Friends, in their Recommendations of him to Secretary *Thurloe*, and the Defence he made before the House of Commons, his Enemies procured his Dismission from his public Employments, in 1659. He then retired to *Ireland* till the Restoration of King *Charles II.* soon after which he came into *England*, and was received very graciously by his Majesty, and was made one of the Commissioners of the Court of Claims. — April 11, 1661, He received the Honour of Knighthood, and the Grant of a new Patent, constituting him Surveyor General of *Ireland*, &c.

Upon the incorporating of the *Royal Society*, he was one of the first Members, and of the Council established therein: And though he had left off the Practice of Physic, his Name was continued as an honorary Member of the College of Physicians.

About this Time, he invented his double bottomed Ship to sail against Wind and Tide, and afterwards gave a Model of this Ship to the *Royal Society*, which is still in their Repository; to whom also, in 1665, he communicated a Discourse about the building of Ships, containing some curious Secrets in that Art: This was taken away by Lord *Brouncker*, saying, it was too great an Arcanum of State to be commonly perused. However, Sir *William's* new planned Ship performed one Voyage from *Dublin* to *Holyhead* in July 1663; but finding it failed in some Respects, he spent two Years or more in perfecting the wished-for Improvement; but at length he declined it, as he could not bring the several Purposes he had in view to unite and coincide with each other.

In 1666, he drew up a Treatise on the Wealth and Expences of *England*, and the Method of raising Taxes in the most equal Manner, which was esteemed a laudible Undertaking and judiciously executed. — The Year following, he married *Elizabeth*, Daughter of Sir *Hardress Waller*, Knt. But this did not draw off his Mind from the Pursuit of other Studies; he thought of public Utility, and communicated them to the *Royal Society*, particularly on the Improvement of Land Carriage, Guns, and Pumps. But a few Years after, all his Pursuits were determined by a Gangrene in his Foot, which put a
Period

The Life of HENRY OLDENBURG. 409

Period to his Life in the 65th Year of his Age, after having made Provision for his numerous Relations for their comfortable Subsistence, and bequeathed several Sums for the Relief of the Poor in several Parishes ; and in his Will, wherein he bequeaths his real and personal Estate (not less than 12,000*l.* *per Ann.*) to his Widow and three Children, he likewise conjured them to pay a principal Regard to public Usefulness. He died in the Profession of that Faith, and in the Practice of such Worship, as were established by the Laws of his Country, rather yielding a submissive Subjection than critically examining theological Subjects. The Variety of Pursuits in which Sir *William* was engaged, shews him to have had a Genius capable of almost every Thing his Inclination led him to enquire into ; and it is a Matter of Wonder that he found Time for Writing near twenty miscellaneous Tracts and Discourses, many of them on interesting and important Subjects, but not being directly of a *physical* Nature, are not here inserted.

The LIFE of HENRY OLDENBURG.

HENRY OLDENBURG, descended from an ancient and honourable Family who were Earls of the County of *Aldenburg* in *Westphalia* : Our Author was born in the County of *Bremen* in the *Lower Saxony*, about the Year 1626, and was Consul for his Countrymen at *London* in the Time of the long Parliament and *Cromwell* ; but being discharged of that Employ, he was made Tutor to the Lord *Henry Obryan*, an *Irish* Nobleman, whom he attended to the University of *Oxford* ; and, in 1656, he entered himself a Student in that University, by the Name of *Henricus Oldenburg*, *Bremensis Nobilis Saxo*, principally for the Advantage of consulting the *Bodleian* Library. He was afterwards appointed Tutor to Lord *Cavendish*, and became intimately acquainted with *Milton* the Poet. During his Residence at *Oxford*, he became also acquainted with the Members of that Society there, which gave Birth to the *Royal Society* ;

and, upon the Foundation of this latter, he was elected Fellow; and when the Society found it necessary to have two Secretaries, he was appointed Assistant to Dr. *Wilkins*. He applied himself, with extraordinary Diligence, to the Business of this Office, and began the Publication of the *Philosophical Transactions* with Number I. in 1664, and, in order to discharge this Task with greater Pleasure to himself, and Satisfaction to the Society, he held a Correspondence with more than seventy learned Persons, and others, upon a vast Variety of Subjects, in different Parts of the World: This would have proved a much greater Fatigue, had not he (as he told Dr. *Lester*) managed it so as to make one Letter answer another; and that to be always fresh, he never read a Letter till he was ready to answer it forthwith; so that the Multitude of his Letters cloyed him not, nor ever lay upon his Hands. Among others, he was a constant Correspondent of the Hon. *Robert Boyle*, and translated many of that ingenious Gentleman's Works into *Latin*.

About the Year 1674, he was drawn into a Dispute with Mr. *Robert Hooke*, who complained, that the Secretary had not done him Justice in the *History of the Transactions*, with Respect to the Invention of the spiral Spring for Pocket Watches: The Contest was carried on with some Warmth on both Sides, but was, at Length, terminated to the Honour of Mr. *Oldenburg*; for, pursuant to an open Representation of the Affair to the *Royal Society*, the Council thought fit to declare, in Behalf of the Publisher, that they knew nothing of Mr. *Hooke* having published a Book intitled, *Lampas, &c.* but “that the Publisher of the *Transactions* had carried himself faithfully and honestly in the managing the Intelligence of the *Royal Society*.”

Mr. *Oldenburg* continued to publish the *Transactions*, as before, till N°. CXXXVI, in 1677; after which, the Publication was discontinued till the *January* following, which was again re-assumed by his Successor in the Secretary's Office, Mr. *Nehemiah Grew*, who carried it on till the End of *February* 1678.

Our Author likewise attended, in some Measure, to theological Controversy, and endeavoured to effect a Reconciliation between the *Calvinists* and *Lutherans*: But, soon after, he sided with the *Calvinists*, took the Covenant, became a Member of the Assembly of Divines at *Westminster*, and had several Places
from

The Life of NEHEMIAH GREW. 411

from them. Afterwards, he joined the Independents, took the Engagement, and all other Oaths that followed, till the Restoration.

Mr. Oldenburg died at his House at *Charlton*, near *Greenwich* in *Kent*, in *August*, 1678, and was interred there.

He published, besides what has been already mentioned, twenty Tracts, chiefly on theological and political Subjects; in which he principally aimed at reconciling the Differences, and promoting Peace: A Catalogue of which may be seen at the Conclusion of his Life, in the *new general Biographical Dictionary*.

The LIFE of NEHEMIAH GREW.

NEHEMIAH GREW, an eminent Physician and Philosopher, the Son of the Rev. Mr. *Obadiah Grew* of *Coventry*, the Place of our Author's Birth, but in what Year Historians have not precisely informed us; but, by some Circumstances, it appears to be about the Year 1628.

Mr. *Nehemiah Grew* was very early prepared for an academical Education, and, as his Father inclined to the Principles of the Nonconformists, he sent his Son abroad to compleat his Education in one of the foreign Universities, where he took the Degree of Doctor of Physic: After which, resolving to settle in *London*, he stood Candidate for an honorary Fellowship in the College of Physicians, and was admitted. He then applied himself, with great Assiduity, to the Practice of Physic, and his Fame for Skill in his Profession particularly recommended him to the Esteem of the *Royal Society*, where he was chosen Fellow some Years before, and, upon the Death of Mr. *Oldenburg*, their Secretary, succeeded him in that Office in 1677, in Consequence whereof, he carried on the Publication of the *Philosophical Transactions* from *January* ensuing till *February* 1678: In the mean Time, pursuant to an Order of Council, that same Year he drew up a Catalogue of the natural and artificial Curiosities belonging to the Society, published at *London* in 1681, in

a folio Volume. — This was soon after followed by a comparative Anatomy of the Stomach and Guts. — In 1682, he published the Anatomy of Plants, Folio. — He wrote several other Treatises, which were so much esteemed by the learned World both at Home and Abroad, that they were translated into *Latin* by Foreigners, viz.

1. Observations on the Nature of SNOW.
2. The Description and Use of the *Pores* of the SKIN.
3. *Cosmologia Sacra*, or a theological Discourse of the UNIVERSE. Folio.

Thus he passed his Time with the Reputation and Advantage of a learned Author, and an able Practitioner in his Profession, till he was suddenly removed by Death, on *March 25*, 1711.

The Life of CLAUDIUS FRANCIS DECHALES.

CLAUDIUS FRANCIS DECHALES was an excellent Mathematician, Mechanic, and Astronomer: He was born at *Chambery*, the Capital of *Savoy*, in the Year 1611: He descended from a noble Family, which had produced many Persons distinguished for their Learning, Capacity, Piety, or Usefulness, of which *Moreri* has specified some. Our Author excelled in the mathematical and mechanical Sciences, not that he was bent upon, or was happy in making new Discoveries; but his Talent rather lay in investigating the Nature, understanding well the Theory, and explaining the same with that Ease and Accuracy, as perhaps rendered him equally useful and deserving Esteem: He is always allowed to have made the best Use of the Productions of other Men, and to have drawn the several Parts of the Science of Mathematics together with great Clearness and Judgment. It is also said of him, that his Probity was not inferior to his Learning, and that both these Qualities made him generally admired and beloved at *Paris*, where, for four Years together, he read public mathematical Lectures in the College of

The Life of EVANG. TORRICELLI. 413

of *Clermont*. ——— Then he removed to *Marseilles*, where he taught the Art of Navigation, and was afterwards Professor of Mathematics in the University of *Turin*, and died the 28th of *March*, 1678, aged 67. ——— Among other Works which do Honour to his Memory are,

I. An Edition of *Euclid's* ELEMENTS, wherein he has struck out the unserviceable Propositions, and annexed the Use of those he has kept in.

II. A Discourse of FORTIFICATION, and another of NAVIGATION: These Performances, with some others, were collected in 3 Volumes, Folio, under the Title of *Mundus Mathematicus*, being indeed a compleat Course of Mathematics: The first Volume includes the first Six Books of *Euclid*, with the Eleventh and Twelfth; an arithmetical Tract, *Theodosius's* Spherics, Trigonometry, practical Geometry, Mechanics, Statics, universal Geography, a Discourse upon the Loadstone, civil Architecture, and the Carpenters Art. The second Volume furnishes Directions for Stone-cutting; military Architecture; Hydrostatics; a Discourse of Fountains and Rivers; hydraulic Machines, or Contrivances for Water-works; Navigation, Optics, Perspective, Catoptrics, and Dioptrics. The third Volume treats of Music; *Pyrotechnia*, or the Operations of Fire and Furnace; a Discourse of the Use of the Astrolabe; Gnomonics, or the Art of Dialling; Astronomy, a Tract upon the Calendar, Astrology, Algebra, and the Method of indivisible and conic Sections. But this Work was afterwards much enlarged, and published in 4 Vol. Folio, at *Leyden*, in 1690.

The LIFE of EVANGELISTE TORRICELLI.

EVANGELISTE TORRICELLI, an illustrious Mathematician and Philosopher of *Italy*, was born at *Faenza*, *October* 15, 1608, and was educated in *Greek* and *Latin* by his Uncle, who was a Monk, probably to qualify him for some ecclesiastical Dignity: But natural Inclination led him to cultivate

mathematical Knowledge, which he pursued some Time upon the Strength of his own Genius, having no Master to instruct him; but at twenty Years of Age he went to *Rome*, where he continued the Study of this Science under Father *Benedict Castelli*. *Castelli* had been a Scholar to the great *Galilei*, and had been called by Pope *Urban VIII.* to be a Professor of Mathematics at *Rome*. *Torricelli*, however, made such Progress in his Studies under this Master, that, having read *Galileo's* Dialogues, he composed a Treatise concerning Motion upon his Principles. *Castelli*, astonished at the Performance, carried it and read it to *Galilei*, who heard it with Pleasure, and conceived an high Esteem and Friendship for the Author: Upon this *Castelli* proposed to *Galileo*, that *Torricelli* should come and live with him, recommending him as the properest Person he could have, since he was the most capable of comprehending those sublime Speculations which his own great Age, Infirmities, and, above all, want of Sight, prevented him from giving to the World. *Galileo* accepted the Proposal, and *Torricelli* the Employment, as Things of all others the most agreeable and advantageous to each. *Galileo* was at *Florence*, whither *Torricelli* arrived the 11th of *October*, 1641, and soon began to take down what *Galileo* dictated, to regulate his Papers, and be as serviceable as he could in that Capacity: But, as pleasing as this Situation was, he did not enjoy the Pleasure of it long; for, at the End of three Months *Galileo* died. *Torricelli* was then about to return to *Rome*, but the grand Duke *Ferdinand II.* engaged him to continue at *Florence*, making him his own Mathematician for the present, and promising him the Professor's Chair as soon as it should be vacant. — Here he applies himself intensely to Mathematics, Physics, and Astronomy, and made many Improvements, with some Discoveries. He greatly improved the Art of making Microscopes and Telescopes; and it is generally acknowledged, that he first found out the Method of ascertaining the Weight of the Atmosphere by Quicksilver, or Mercury, the Barometer being called from him the TORRICELLIAN, TUBE, and TORRICELLIAN EXPERIMENT. Great Things were expected from him, and great Things would probably have been performed by him, if he had lived: But he died, after a few Days Illness, the 25th of *October*, 1647, when he had just entered his fortieth Year.

He had published, at *Florence*, in 1644, a Volume entitled, *Opera Geometrica*, in Quarto, and a posthumous Piece, published 1715, called, *Lezioni Accademiche*. These are Discourses delivered by Way of Oration LECTURES, the first to the Academy of *La Crusca*, for being admitted a Member of that Body : The rest are upon Subjects of Mathematics and Physics.—Prefixed to the Whole, is a long Life of *Torricelli*, by *Thomas Buonaventuri*, a Gentleman of *Florence*.

The LIFE of PETER PETIT.

PETER PETIT, a Mathematician of *France*, was born at *Montlucon* in the Year 1600, and there spent the first Part of his Life, where he cultivated, from his Youth, Mathematics and Philosophy : He was celebrated for his Writings and for his Connections with *Pascal* when he was but about 30 Years of Age ; and his Fame having reached *Paris*, he received Invitations to go thither, which he complied with in 1633, and was then employed on several Occasions by Cardinal *Richlieu* : He was commissioned by this Minister to visit the Sea Ports, and had the Title of the King's Engineer ; and was also sent into *Italy*, on special Affairs, by his Majesty. He was at *Tours* in 1640, and married there, and was afterward advanced to be Intendant of the Fortifications. Mr. *Baillet*, in his Life of *Des Cartes*, speaks of our Author as having a strong Genius for Mathematics, and excelling particularly in Astronomy, owing, in great Measure, to the Pains he took for experimental Knowledge. About the Year 1637, he went to *Paris* : After his Return from *Italy*, where he heard much Talk of the Dioptrics of *Des Cartes*, he read it, and communicated his Objections to *Mersennus*, with whom he was intimately acquainted. Nevertheless, he soon after fell into the Principles of *Des Cartes*, which have been greatly admired at by many of his Acquaintance at that Time. As we before intimated he was acquainted with *Monf. Pascal*, with whom he made, at *Rouen*, the same Experiments which *Torricelli* had before made in *Italy*, and was assured of their Truth
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by frequent Repetitions: This was in 1646 and 1647, and though there appears to be a long Interval from this Time to that of his Death, we meet with no other Memoirs of his Life. He died the 20th of *August*, 1667, at *Laguy* near *Paris*, whither he had retired for some Time before his Decease. He was the Author of several Works upon physical and astronomical Subjects; a Piece on Chronology, and in Defence of Mr. *Joseph Scaliger*, printed at *Paris*, 1636.

The LIFE of JAMES ROHAULT.

JAMES ROHAULT, a *French* Philosopher, was the Son of a rich Merchant of *Amiens*, and born there in 1620: He cultivated the Languages and *Belles Lettres* in his own Country, and then went to *Paris* to study Philosophy: He read both the ancient and modern Philosophers, and seems to have been an assiduous and impartial Enquirer after Truth; but was not altogether happy in fixing on the best Scheme, supported by truly philosophical Principles; *Des Cartes* struck him most, and he became a zealous Follower of this great Man, and drew up an Abridgment and Explanation of his Philosophy with great Clearness and Method: By this Means he ingratiated himself into the Esteem of *Clerfeller*, a Person well known for his Translation of many Pieces of *Des Cartes*, so that he gave him his Daughter in Marriage, contrary to all the Remonstrances of his Family: He afterwards continued as his Companion in the Study and Improvement of this Science; so that his Character became in great Repute among all who favoured the Philosophy of *Des Cartes*. ——— The most considerable Piece he wrote is entitled, *Robault's Physics*; originally written in *French*, but has been translated into *Latin* by Dr. *Samuel Clarke*, with Notes, in which the *Cartesian* Errors are corrected upon the *Newtonian* System: The best Edition is that of 1718. Mr. *Robault* likewise wrote, *Elements of Mathematics*, by Way of Dialogue; in which he favoured too much the Principles of *Des Cartes*.

The Life of BERNARD LAMY. 417

Robault died in 1675, and left behind him the Character of an amiable, as well as a learned and philosophic Man.

The LIFE of BERNARD LAMY.

BERNARD LAMY, a *French* Protestant Divine and Philosopher, was born at *Mans* in the Year 1640: His Father, *Allan Lamy*, (Lord of *Fontaine*) perceiving a very promising Genius in his Son, resolved to give him a liberal Education, and, for that Purpose, provided particular Masters to instruct him; but under these he made no great Proficiency, the Method which they took did not suit the Turn of his Genius, and gave him some Dislike to the *Latin* Language: This, however, happened to be cured by the Pleasure he took in the Elements of the *Roman* History and Geography, which were taught him by one of his Masters. Hence, as soon as his Age would permit him, he was sent to the College of *Mans*, to study under the Fathers of the Oratory: Here he made an extraordinary Progress in the Study of the *Greek* and *Latin* Tongues, Grammar, Rhetoric, the Study of the ancient Poets, Orators, and Historians, as well as in Theology and the Practice of Piety; there he resolved to make the first and principal End of his Pursuit: To this End he went to *Paris* in 1658, and entered himself into the Institution, and applied himself with ardent Zeal to fulfil all the Duties of it. He had a great Taste for the mechanical, geometrical, and philosophical Sciences, and therefore he determined to give scope to the Bent of his Mind this Way; and accordingly he went through a regular Course of Philosophy at *Saumur*, under the Father of *Fontinelle*: And about the Year 1661, he went to *Vendosme*, in order to perfect himself in his Humanities, or learned Languages. — He was sent to the University at *Juilli* in 1664, and entered into the Priesthood in 1667, and afterwards had the Care of instructing the Youth in the College of *Mans*, where he continued for two Years, and then returned again to *Saumur* to study Philosophy. The Fathers *Le Port* and *Martin* were his Masters in this Science; and, as soon as he had finished his

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Course under them, he taught Philosophy in the same Place, and afterwards at *Angiers*. His Attachment to the new Philosophy disgusted several Persons who were prepossessed in Favour of the *Aristotelian* Philosophy, insomuch, that they procured an Order from Court obliging him to quit *Angiers*. — In 1676, he went to *Grenoble*, where Cardinal *Camus*, having an Opportunity of knowing his Merit conceived a great Esteem for him, and would have him near his Person, and drew considerable Service from him in the Government of his Diocese. After contributing many Years to the Instruction and Edification of that Diocese, he went to reside at *Rouen*, where he died, *January* 29, 1715, at the Age of 75 Years. His Character is truly great, as he knew how to reconcile the Amusements of the *Belles Lettres*, and the Flowers of Rhetoric and Poetry with the Study of the Languages; the profound Meditations of the Mathematics with the Thorns and Briars of Criticism; the Pagan Philosophy with Christian Morality; and the liberal Arts with the Study of the Holy Scriptures: Together with theological and rabbinical Literature. He had a quick Apprehension, and an easy Elocution: He wrote well both in *French* and *Latin*, and carried his Conjectures, as well as Reasoning, to a proper Length. To conclude: To a profound Erudition, he joined the Virtues of a Minister of the Gospel; and his Charity, Humility, and Love of Peace, were the Ornaments of his Life. He wrote several Books on the Subjects of Rhetoric, Mechanics, and on the Elements of Geometry; but his Treatise on the PRINCIPLES OF PERSPECTIVE, with a View to the *Rationale* of PAINTING, is that by which he is best known in the literary World.

The LIFE of JOSEPH SAUVEUR.

JOSEPH SAUVEUR, an eminent *French* Mathematician, was born at *La Fleche* the 24th of *March*, 1653: He was absolutely Dumb till he was seven Years of Age, and then the Organs of Speech did not disengage themselves so effectually; but

but that he was ever afterward obliged to speak very slowly and deliberately: He very early discovered a peculiar Genius for Mechanics, and was always inventing and constructing something or other in that Way. He was sent to the College of the Jesuits to learn polite Literature, but made very little Progress in Poetry and Eloquence: *Virgil* and *Cicero* had no Charms for him; but Books of Arithmetic and Geometry he read with Greediness. However, he was prevailed on to go to *Paris* in 1670, and applied himself, for a Time, to the Study of Philosophy and Theology; but succeeded no better: In short, Mathematics was the only Study he had any Passion or Relish for, and this he cultivated with extraordinary Success; for during his Course of Philosophy, he learned the six first Books of *Euclid* in one Month without a Master. As he had an Impediment in his Voice, and was found to be a Person of extraordinary Abilities; he was much persuaded by Monsieur *Bossuet* to apply himself to the Study of Physic: But this being utterly against the Inclination of his Uncle, from whom he drew his principal Resources, our Author determined to devote himself to his favourite Study, and to perfect himself therein, so as to teach it for his Support, and, from his close Application, soon became the Mathematician, *à la Mode*, and at 23 Years of Age he had Prince *Eugene* for his Scholar. — He had not yet read the Geometry of *Des Cartes*; but a Foreigner of the first Quality desiring to be taught it, he made himself Master of it in an inconceivable small Space of Time. — *Basset* being a fashionable Game at that Time, the Marquis of *Dangeau* asked him for some Calculations relating to it, which gave such Satisfaction, that *Sauveur* had the Honour to explain it to the King and Queen: This was in 1678.

In 1681, he was sent with Mr. *Mariote* to *Chantilli* to make some Experiments upon the Waters there, which he did with much Applause. — In 1686, he was made mathematical Professor of the *Royal College*, and, in 1696, admitted a Member of the *Academy of Sciences*, where he was in high Esteem with the Members of that Society. Here he became particularly acquainted with the Prince of *Conde*, and received many Marks of his princely Favour.

About this Time, he conceived a Design of writing a Treatise upon Fortification, and, in order to join Practice with Theory, went to the Siege of *Mons* in 1691, where he continued all the while in the Trenches: He likewise made the Tour of *Flanders* with this View, and so far approved himself by his Affiduity and Skill, that he was favoured with a Pension from the Court of *France* for Life.

He was twice married: The first Time he took a very singular Precaution; for he would not go to see the Woman till he had fully determined on the Conditions, and had been with a Notary, and had them reduced to Writing in a proper Form, that they might be ready to present before his Mind was captivated with her Person, and he thereby rendered less Master of himself. This was acting like a Mathematician, who always proceeds by Rule and Line, and makes his Calculations when his Head is cool. — He had Children by both his Wives; and, by the latter, a Son who, like himself, was Dumb for the first seven Years of his Life. — He died, *July* 1716.

It is very strange that some of our voluminous biographical Authors have taken no Notice of this great Mathematician and Philosopher; and what is still more Wonderful is, that those who have pretended to write his Life, have yet taken no Notice of the most extraordinary Part of his Character, *viz.* “That though he had neither a *musical Voice* or *Ear*, yet he studied no Science more than *MUSIC*, and had composed an entire *New System* thereof. And though he was obliged to borrow other Peoples Voice and Ears, yet he amply repaid them with such Demonstrations as were unknown to former Musicians. — He introduced a *new Diction* in Music, more appropriate and extensive. — He invented a new Doctrine of Sounds. — He was the first of Men that discovered, by Theory and Experiment, the *Velocity* of musical Strings, and the Spaces they described in their Vibrations, under all Circumstances of Tension and Dimensions. — He first invented for this Purpose the *Monochord* and the *Echometer*. — In fine, he pursued his Researches even to the *Music* of the ancient *Greeks* and *Romans*, the *Arabs*, and the very *Turks* and *Persians* themselves; so jealous he was, lest any Thing should escape him in the Science of Sounds.

The Life of BERN. NIEUWENTYT. 421

His Writings, which consist of Pieces rather than of Set works, are all inserted in the Memoirs of the *Accademy of Sciences*, on many geometrical, mathematical, philosophical, and musical Subjects.

The LIFE of BERNARD NIEUWENTYT.

BERNARD NIEUWENTYT, an eminent *Dutch* Philosopher and Mathematician, was born on the 10th of *August*, 1654, at *Westraadyt* in *North Holland*, of which Place his Father, *Emanuel Nieuwentyt*, was Minister; he discovered very early a strong Genius for Learning, which was carefully improved by a suitable Education; and withal he had that Sagacity and Prudence, that led him to pursue Learning by proper Steps, and to acquire a Kind of Mastery in one Science before he proceeded to another. His Father, indeed, designed him for the Ministry; but, seeing his Inclination did not lie that Way, he prudently left him to pursue the Bent of his Genius. Accordingly, young *Nieuwentyt*, apprehending that nothing was more useful than fixing his Imagination and to form his Judgment well, applied himself early to Logic, and the Art of reasoning justly, in which he grounded himself upon the Principles of *Des Cartes*, with whose Philosophy he was greatly delighted: From thence he proceeded to the Mathematics, and, when he had, in some good Degree, acquired mathematical Knowledge, he applied himself to the Study of Physic; and after good Proficiency therein, he betook himself to the several Branches of Law. — He succeeded in all these Sciences so well as to acquire the Character of a good Philosopher, a great Mathematician, an able Physician, and an expert and just Magistrate. — Although he was naturally of a grave and serious Disposition, yet he was very affable and agreeable in Conversation; his engaging Manner procured him such a general Esteem, that, by this Means, he frequently drew over to his Opinion those who at first widely differed from him. Thus accomplished, he acquired a great Esteem and Credit in the Council of the Town of

Puremerend, where he resided; as he did also in the States of that Province, who respected him the more, inasmuch as he never engaged in any Cabals, or Factions, in order to secure it; regarding, in his Conduct, an open, honest, upright Behaviour, as the best Source of Satisfaction. In Reality, he was more attentive to cultivate the Sciences, than eager to obtain the Honours of the Government, contenting himself with being Counsellor and Burgo-master in the Town, without courting, or accepting any other Posts, which might interfere with his Studies and draw him too much out of his Library. He died the 7th of *May*, 1730, aged 76, having been twice married. He wrote several Pieces in *Latin* and *French*, viz.

- I. Considerations on the Analysis of Quantities infinitely small.
- II. The Analysis of *Curves* by the Doctrine of *Infinites*.
- III. Considerations on the Principles of the *differential Calculus*.

IV. A Treatise of the new Use of the Tables of Sines and Tangents.

V. Contemplations on the UNIVERSE, &c. which was translated into *English* under the Title of, *the Religious Philosopher*: Which has been very well received and gone through several Editions. We have also, by our Author, one Letter to *Bothnia* of *Burmania*, up the Subject of Meteors; and a Refutation of *Spinoza* in *Dutch*, 4to.

The LIFE of JAMES BERNOULLI.

JAMES BERNOULLI, a celebrated Mathematician, was born at *Basil*, Dec. 27, 1654, where his Father was of considerable Rank. He was educated with great Care, and, as he was designed for a Minister, he went through a regular Course of Studies: After he had made himself Master of polite Literature, he learned the old Philosophy of the Schools; and having finished the usual Course, and taken his Degrees, according to Custom, in the University of *Basil*, he studied Divi-

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nity, not so much out of Inclination as Complaisance to his Father. He was engaged in this Manner when he happened, by Chance, to meet with some mathematical Figures which greatly raised his Curiosity; and, the natural Propension he had to that Science became more and more conspicuous, and that he soon became a good Proficient in Geometry, without the Assistance of a Master, and, at first, under very great Difficulties for want of Books: And the far greater Discouragement he met with from his Father was no small Obstruction to his Progress in this Science. This gave Occasion for his chusing, for his Device, *Phaeton* driving the Chariot of the Sun, with these Words, *Invito patre sidera verso*. I traverse the Stars against my Father's Inclination. But notwithstanding the Difficulties he met with, he overcome them all, and, in 1676, he began his Travels to *Geneva* and other Parts of *Germany*. While he was at *Geneva* he found out a Method to teach a young Girl to write, though she was blind, and had been so from the Age of two Months.

—— He afterwards went to *Bordeaux* in *France*, where he composed *Gnomonic* Tables; and visited many other Parts of *France* in order to acquaint himself with the most celebrated Persons in that Science, and gather what Improvement he could from them. Having seen *France*, he returned to his own Country in 1680: It was then, that, by the Advice of his Friends, he read Father *Manbranche's* Search after Truth, and *Cartesius's* Philosophy, whose Method he more approved of than his Principles.

At this Time there appeared a Comet, which, as he expected, employed his Thoughts a good Deal, and he wrote a Treatise upon it in his own Language.

Soon after this he travelled into *Holland*, *Flanders*, and *England*. —— In *Holland* he applied himself more than he had done before to the new Philosophy; but especially to that noble Part of Mathematics which consists in resolving of Problems, and in Demonstrations which he was not before well versed in: He read *Cartesius's* Geometry with the utmost Attention, and soon made himself Master of the most difficult Parts. —— He likewise translated into *Latin* his Essay upon the Comets, which was soon followed by his little Treatise of the Weight of the Air. —— Having seen *Flanders* and *Brabant*, he went to *Ca-*
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lais and passed over into *England*. At *London*, where he contracted an Acquaintance with all the most considerable Persons in the several Sciences, and was greatly esteemed by them, he had the Satisfaction of being present at the Conferences which were held every Week at the House of the celebrated Mr. *Boyle*, who shewed a great regard for our Author. Here he resided for near two Years, and then he returned home and resolved to make his Studies useful to the World. Accordingly, he thought nothing would contribute more to this Design, than to shew to the World a Course of Experiments in natural Philosophy and Mechanism. He greatly distinguished himself by this Means in the City of *Basil*, exhibiting a great Variety of new Discoveries which were unknown to them before.

In 1682, he published his Essay of a new System of Comets, in order to calculate their Motions and ascertain their Appearances. — The Year following he printed his Dissertation upon the Weight of the Air: In this Piece he not only treats of the Weight of the Air, which appears so incontestible from Experience and the Barometer, but he speaks very particularly of the *Æther*, which he supposes to be a Matter much more fine and subtle than what we breathe. He accounts for the Hardness of Bodies from the Weight and Pressure of the Air: And though this was a Conjecture before advanced, he mentions in the Preface, it was the Result of his Enquiries, and, in that respect, new, though otherwise it was not.

In the Year 1684, he was invited to be Professor of the Mathematics at *Heidelberg*; and he was just entering upon that Engagement when he was diverted from it by marrying a Lady of very good Family.

Mr. *Leibnitz* having, about that Time, published some Essays of his new *Calculus Differentialis*, but concealed the Art and Method of it, Mr. *Bernoulli*, and one of his Brothers (who was likewise a famous Geometrician), discovered, by the little which they saw of this *Calculus*, the Beauty and Extent of it: They endeavoured, therefore, immediately to unravel the Secret, which they did with such Success, and carried the Method to such Perfection, that Mr. *Leibnitz*, with a Frankness and Sincerity worthy a great Man, declared, that the Invention belonged as much to them as to himself.

In 1687, the Professorship of Mathematics at *Basil* being vacant by the Death of *Peter Megertin*, Mr. *Bernoulli* was chosen in his Room, by the unanimous Consent of the Magistrates, and discharged that Function with Satisfaction and Applause: His Reputation drew to *Basil* a great Number of Foreigners, who came from all Parts to hear his Lectures.. He had an admirable Talent in teaching, and a peculiar Art in adapting himself to the different Genius and Capacity of his Scholars; and the Turn which he gave to the most difficult and obscure Subjects, rendered them clear and obvious to Persons of common Sagacity and Penetration.

In 1699, the Academy of Sciences at *Paris* being put under a new Form, Mr. *Bernoulli*, with his Brother Mr. *John Bernoulli*, were admitted into it as foreign Members; and, in 1701, they were both chosen Members of the Academy of *Berlin*. He had by this Time wrote several Pieces, besides those before-mentioned, of which there is a Catalogue of about 50 in the *general Biographical Dictionary*, most of which are published in the *Acta Eruditorum* of *Leipsic*, *Journal des Scavans*, *Memoires* of the *Royal Academy of Sciences*, and other philosophical Transactions. — His continual Application to the Discharge of his Professorship, and to his Studies, threw him into the Gout, and, by Degrees, reduced him to a slow Fever, of which he died the 16th of *August*, 1705, aged fifty Years. He left one Son and one Daughter. — *Archimedes* having found out the Proportion of a Sphere, to a Cylinder circumscribed about it, which was a Discovery of prodigious Difficulty, and Matter of great Consideration at that Time, though very easily performed by the present Methods, he ordered it to be engraved upon his Monument. In Imitation of him, Mr. *Bernoulli* appointed that a Spiral logarithmical Curve should be inscribed upon his Tomb, with these Words, *Eadem mutata resurgo*, i. e. *I rise the same, though changed*, in Allusion to the Hopes of a Resurrection; which are represented, in some Measure, by the Properties of the Curve which he had the Honour of discovering first.

The LIFE of WILLIAM MOLYNEUX.

WILLIAM MOLYNEUX, an excellent Mathematician and Astronomer, was born at *Dublin* in *Ireland* on the 17th of *April*, 1656, (where his Father, a Gentleman of Family and Fortune, lived,) and being of a tender Constitution, he was educated under a private Tutor, at Home, till he was near fifteen Years of Age, and then placed in the University of *Dublin*, under the Care of Dr. *William Palliser*, afterwards Archbishop of *Cashell*. He distinguished himself here by the Probity of his Manners, as well as by the Strength of his Parts, and having made a remarkable Progress in academical Learning, and particularly in the new Philosophy, as it was then called, he proceeded, at the regular Time, to his Bachelor of Arts Degree. After four Years spent in this University, he left it, and, being sent to *London*, was admitted into the *Inner Temple* in *June*, 1675. He staid there three Years, and applied himself to the Study of the Law of his Country, as much as was necessary for one who was not designed for the Profession of the Law: But the Bent of his Genius, as well as Inclination, lying strongly to Philosophy and the Mathematics, he spent the greatest Part of his Time in these Enquiries, which, from the extraordinary Advance newly made therein by the *Royal Society*, were then chiefly in vogue.

Thus accomplished, he returned to *Ireland* in *June*, 1678, and shortly after was married to *Lucy*, Daughter of Sir *William Dornvile*, the King's Attorney General. Being then Master of an easy Fortune, he continued to indulge himself in prosecuting such Branches of natural and experimental Philosophy as were most agreeable to his Fancy; wherein, Astronomy having the greatest Share, he began, about the Year 1681, a literary Correspondence with Mr. *John Flamsteed*, the King's Astronomer, which he kept up for several Years.

In 1683, he formed a Design of erecting a philosophical Society like that at *London*, and, by the Countenance and Encouragement of the famous Sir *William Petty*, who accepted the Of-
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fice of President, they began a weekly Meeting about *Michaelmas* that Year, when our Author was appointed their first Secretary. The Reputation of his Parts and Learning, which, by Means of this Society, became more known; introduced him to the Esteem of Persons of the first Rank.

In 1684, by the Friendship and Influence of the Duke of *Ormond*, then Lord Lieutenant of *Ireland*, he was appointed, jointly with Sir *William Robinson*, Surveyor of his Majesty's Buildings and Works, and Chief Engineer.

In *March*, 1685, he was chosen Fellow of the *Royal Society*, at *London*; and that Year, for the Sake of improving himself in the Art of Engineering, he procured an Appointment from the *Irish* Government to view the most considerable Fortresses in *Flanders*. Accordingly he travelled thro' that Country and *Holland*, and some Parts of *Germany* and *France*, and carrying Letters of Recommendation with him, from Mr. *Flamsteed* to Mr. *Cassini*, he was introduced to him, and others the most eminent Astronomers in the several Places through which he passed.

Soon after his Return from abroad, in 1686, he printed his *Sciothericum Telescopium*, containing a Description of the Structure and Use of a Telescopic Dial, invented by him, and which was reprinted with some Improvements in 1700.

When Sir *Isaac Newton* published his *Principia*, the following Year, 1687, our Author was struck with a pleasing Astonishment, though Mr. *Edmund Halley*, with whom he constantly corresponded, had sent him several Parts of this inestimable Treasure, as they came from the Press, before the whole was finished, assuring him that he looked upon it as the utmost Effort of human Genius: And some Time after it was published, Mr. *Flamsteed* desiring his Opinion of it, Mr. *Molyneux* wrote a very critical and philosophical Answer, of which we shall give the following short Extract, viz. "May 19, 1688, Sir, You desire to know our Thoughts of Mr. *Newton's* Book, and to this I answer, that I have not yet had time to settle to it seriously; for I find I must rub up all the little Notions I have of Conics, and the Doctrine of Ratios, which are half slipped out of my Head, before I venture upon it; and I question, after all, whether I shall be able to Master it; for I perceive it is a Piece that requires great Application, or else it is invincible: Nor do

I know any mathematic Head in this Place that has thoroughly considered the whole, unless it be the honourable Mr. *Roberts*: He tells me he has run through Mr. *Newton*'s Book, and finds it really admirable. One Observation in Mr. *Newton*'s Book, though not first started there, I think to be truly wonderful to all Mortals, and that is, the *Sesquialtera ratio* between the Periods and Distances of the Planets, and this not only among the primary Erratics, but even among the lesser Setts of Dancers.

—— It is in my Opinion, a most amazing Thought, to consider how universally this great Law runs through the whole Frame of Nature, and agrees to Bodies at such vast Distance, and that seem to have no Tie or Respect to each other. It is, to me, the strongest Argument that can be drawn from the Frame of this Universe, for the Proof of a God, to see one Law so fixed and inviolable among those vast and distant Chori, who therefore could not be put into this Posture and Motion by Chance, but by an omnipotent intelligent Being."

In 1688, the philosophic Society at *Dublin* was broke up and dispersed, by the Confusion of the Times: Mr. *Molyneux* had distinguished himself as a Member of it, from the Beginning, by presenting to it several Discourses upon curious Subjects, some of which were transmitted to the *Royal Society*, and afterwards printed in the *Philosophical Transactions*.

In 1689, among great Numbers of other Protestants, he withdrew from the Disturbances in *Ireland*, and, after a short Stay in *London*, he went with his Family to reside at *Chester*. In this Kind of Retirement he employed himself in putting together the Materials he had some Time before prepared for his *Dioptrics*, in which he was much assisted by Mr. *Flainstead*: And in *August*, 1690, he went to *London*, put it to the Press, and submitted the Revise of it to Mr. *Edmund Halley*, who, at our Author's Request, gave leave for printing, in the Appendix, his celebrated Theorem for finding the *Foci* of Optic Glasses. Accordingly the Book came out in 1692, in 4to, under the Title of *Dioptrica Nova*: A Treatise of *Dioptrics* in two Parts, wherein the various Effects and Appearances of Spherical Glasses both convex and concave, single and combined, in Telescopes and Microscopes, together with their Usefulness in many Concerns of human Life. This Work does not contain any of the

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more curious Speculations therein, that being foreign to his Design, but several of the most generally useful Propositions for Practice are demonstrated in a clear and easy Manner. The second Part is very entertaining, especially in his History which he gives of the several Optical Instruments, and of the Discoveries made by them. The Dedication of the Dioptrics being addressed to the *Royal Society*, he takes Notice, among other Improvements in Philosophy by building it upon Experience, of the Advances that had been lately made in Logic, “by the incomparable Mr. *John Locke* in his Essay upon *Human Understanding*. This drew a Letter of Thanks from Mr. *Locke* to our Author, and introduced an Acquaintance that presently grew to an intimate Friendship, and a mutual Correspondence subsisted betwixt them as long as Mr. *Molyneux* lived, to whom many Improvements, made in the second Edition of the Essay on *Human Understanding*, must be attributed.*

Before he left *Chester* he lost his Lady, who died soon after the Birth of a Son. Illness had deprived her, in a great Measure, of her Sight for twelve Years before, which attended her, soon after her Marriage, ’till the Time of her Death, which, notwithstanding it often creates an Indifference to each other, it was rather an Incentive to Sympathy and Affection.

As soon as the public Tranquility was restored in his native Country, he returned home, and, upon the convening of a new Parliament in 1692, was chosen one of the Representatives of the City of *Dublin*. In the next Parliament, 1695, he was chosen to represent the University there, and continued to do so to the end of his Life, that learned Body having, before the End of the first Session of the former Parliament, conferred on him the Degree of *Doctor of Laws*. He was likewise nominated by the Lord Lieutenant, one of the Commissioners for the forfeited Estates, to which Employment was annexed a Salary of 500*l. per Annum*, but, looking upon it as an invidious Office and not being a Lover of Money, he declined it.

In

* Mr. *Molyneux* was not so happy as to enjoy the good Opinion of Mr. *Flamsteed* to the last, as appears by some marginal manuscript Notes he wrote in the above Book, (in a Copy I have seen) which are very hard both on his moral and literary Character.

In 1698, he published, *The Case of Ireland stated*, in Relation to its being bound by Acts of Parliament made in *England*, in which he is supposed to have delivered all or most that can be said upon this Subject with great Clearness and Strength of Reasoning. What occasioned Mr. *Molyneux* to write the above Tract was, his conceiving the *Irish* woollen Manufactory to be oppressed by the *English* Government, on which Account he attempted to vindicate his Country's Independency. He had communicated to Mr. *Locke* his Thoughts on this Subject before it was ready for the Press, and desired his Sentiments upon the fundamental Principle upon which it was grounded. In Answer to which, that Gentleman, intimating that the Business was of too large an Extent for the Subject of a Letter, proposed to talk the Matter over with him in *England*. This, together with a Purpose Mr. *Molyneux* had long formed of paying that great Man, whom he had never yet seen, a Visit, prevailed with him to cross the Water once more, although he was then in a very infirm State of Health: Accordingly he did in *July* this Year, and staid in *England* 'till the Middle of *September*; but the Pleasure of this long wished-for Interview, which he intended to have repeated the following Spring, seems to have been purchased at the Expence of his Life, for, shortly after, he was seized with a severe Fit of his constitutional Distemper, the Stone, which put a Period to his Life *October* 11th, 1698, bequeathing, by his last Will, to *John Locke*, Esq; five Pounds to buy a Ring, in Memory of the Value and Esteem he had for him. Besides the Works already mentioned to have been published by him, he likewise published several Pieces on curious Subjects in the *Philosophical Transactions*.

His Son, *Samuel Molyneux*, born at *Chester* in 1689, and educated with great Care by his Father, and on his Decease committed to the Care of his Uncle Dr. *Thomas Molyneux*, inherited the Genius and Disposition of his Father, and being suitably prepared by a liberal Education became a most polite and accomplished Gentleman, and was made Secretary to his late Majesty when he was Prince of *Wales*. Astronomy being his favorite Study, as it had been his Father's, he projected many Schemes for the Advancement of it, and was particularly employed,

The Life of THOMAS BRANKER. 431

ployed, in the Years 1723, 1724, and 1725, in perfecting the Method of making Telescopes, one of which of his own making he presented to *John V. King of Portugal*. But, in the Midst of these Thoughts, he being appointed a Commissioner of the Admiralty, he became so engaged in public Affairs that he had not Leisure to pursue these Enquiries any farther, and gave his Papers to Dr. *Robert Smith*, Professor of Astronomy at *Cambridge*, whom he invited to make Use of his House and Apparatus of Instruments in order to finish what he had left imperfect: But Mr. *Molyneux* dying soon after, Dr. *Smith* lost that Opportunity; notwithstanding which, he supplied what was wanting in the best Manner he could from Mr. *Huygens* and others, and published the whole in his *Compleat Treatise of Optics*.

The LIFE of THOMAS BRANKER, *or* BRANCKER.

THOMAS BRANKER, an eminent Mathematician, Son of *Thomas Branker*, sometime Bachelor of Arts in *Exeter College*, in *Oxford*, was born in *Devonshire* in 1636, and was admitted Butler of the said College November 8, 1652, being then about seventeen Years of Age. — June the 15, 1655, he took the Degree of Bachelor of Arts, and was elected Probationer Fellow the 30th of the same Month. — April 22, 1658, he took the Degree of Master of Arts, and became a Preacher; but, after the Restoration, refusing to conform to the Ceremonies of the Church of *England*, he left his Fellowship in 1662, and returned to *Chester*: But not long after, he was reconciled to the Service of the Church, and, taking Orders from a Bishop, was made a Minister of *Whitegate*. He had however, for some Time, enjoyed great Opportunity and Leisure for pursuing the Bent of his Genius in the mathematical Science, and his Skill both in the Mathematics and Chymistry procured him the Favour of Lord *Brereton*, who gave him the Rectory of *Tilston*, and was afterwards chosen Master of the well endowed

endowed School at *Macclesfield*, in that County, where he spent the Remainder of his Life. He wrote a Piece on the Doctrine of the Sphere, in *Latin*, which was published at *Oxford* in 1662; and, in 1688, he published a Translation of *Rhoni*'s *Algebra*, with the Title of *An Introduction to Algebra*, which he communicated first to Mr. *John Pell*, and from him received some Assistance towards improving it, which he generously acknowledges in a Letter to Mr. *John Collins*, with whom and some other Gentlemen, Proficients in this Science, he continued a Correspondence during Life: But this was terminated by a short Illness when he was at the Age of 40 Years, and he was interred in the Church at *Macclesfield* in November, 1676.

The LIFE of EDMUND HALLEY.

EDMUND HALLEY was born at *St. Leonard Shoreditch*, near *London*; his Father, who was in affluent Circumstances, determining to improve the promising Genius of his Son by a suitable Education, sent him first to *St. Paul's School* under the Care of the eminent Master Dr. *Thomas Gale*, where his Proficiency soon became conspicuous, and at the Age of Fifteen he was not only skilled in many Branches of classical Learning, but had made extraordinary Advances in the Mathematics, in plain and spherical Trigonometry, in the Science of Navigation; and likewise great Progress in Astronomy before he was removed to *Oxford*. Mr. *Wood* tells us, he had perfectly learnt the use of the Celestial Globe, and could make a compleat Dial.

He went to *Oxford*, and was entered a Commoner in *Æt Term*, 1673, being then in the 17th Year of his Age. Here he devoted himself to the Study of Astronomy, being furnished by his indulgent Father with a curious Apparatus of Instruments for that Purpose, and soon acquired such Skill in this Science, that, at 19 Years of Age, he published *A direct and geometrical Method of finding the Aphelia and Excentricity of the Planets*, the Want of which, 'till that Time, had occasioned Reflections on *Kepler's Hypothesis*, *Kepler* having built his Theory upon the

sure

sure Foundation of Facts, as they appeared in the astronomical Tables of *Tycho Brahe*, for he thought that sufficient, leaving the geometrical Proof of it to others. — Nor did he less distinguish himself in the Improvements he made in other Parts of Astronomy; besides an Eclipse of the Moon, *June 17, 1675*, on which he made some curious Observations: He made some Discoveries with Respect to a Spot in the Sun, seen at *Oxford* in *July* and *August, 1676*, which were afterwards published in the *Philosophical Transactions*. By these the Motion of the Sun round its own Axis, a Phænomenon 'till then not thoroughly ascertained, was fully and finally determined. — *August 21*, the same Year, he observed the Occultation of *Mars* by the Moon, which he made use of afterwards in settling the Longitude of the *Cape of Good Hope*, against the Objections of the *French Astronomers*. During his Stay at *Oxford*, he also accurately observed the Motions of *Jupiter* and *Saturn*, whereby he made several Corrections in the best of those astronomical Tables then extant of those Planets. — About this Time also, (before his Voyage to *St. Helena*,) he had discovered the Method, now well known, of constructing Eclipses of the Sun, by which Means the Calculation of Parallaxes in those Phænomena was superseded. Neither yet was his Industry confined within these Limits; but all this Time he had been careful to make the proper Observations for ascertaining the true Places of the fixed Stars, and thereby correcting the Errors of *Tycho Brahe*. His original View therein was to carry on the Design of that first Restorer of Astronomy, by compleating the Catalogue of those Stars from his own Observation: But, upon farther Enquiry, finding this Province taken up by *Mr. Hevelius* and *Mr. Flamsteed*, he dropt that Pursuit, and immediately formed a Resolution of perfecting the whole Scheme of the Heavens, by the Addition of the Stars which lie so near the South Pole, that they could not be observed by the Astronomers either at *Dantzick* or *Greenwich*, as never rising above their Horizon. Animated with the Prospect of making so distinguished an Improvement in his favorite Science, he left the University before he had been there long enough to take any Degree, and returning to his Father, applied for his Consent to his Voyage to *St. Helena*, to which his Father consented; and thereupon our Author address-

fed himself to Sir *Joseph Williamson*, then Secretary of State, and Sir *Jonas Moor*, Surveyor of the Ordnance, a Lover of Mathematics, and a Promoter of the Science, who both applauded his Purpose and communicated it to King *Charles II.* who approved the Design, and no Expedient was omitted for rendering his Voyage easy, agreeable, and successful; and, pursuant thereto, he embarked for that Isle in 1676, where he arrived safely in three Months, and applied himself diligently to the Use of his Telescopes, 'till he had entirely finished the Task he had undertaken, and compleated his Catalogue: This done, he returned to *England* in *November*, 1678, with Satisfaction to himself and Applause from the Curious in this Science.

During the Navigation, in his Passage he had frequently observed a great Inconvenience in an Instrument well known to the Seamen by the Name of *Davis's Quadrant*, which then had only a Shadow-Vane to the lesser Arch, wherefore he added a Glass to that Vane. This was a very considerable Improvement to this Instrument, as the Spot of Light, exhibited by the Glass, can be clearly seen at such Times, when the Shadow is so faint that its Edge cannot be sufficiently discerned.

Not long after, he delineated a Planisphere, wherein, with the nicest Accuracy, he laid down the exact Places of all the Stars near the South Pole, from his own Observations; which he presented, with a short Description thereof, to his Majesty, which was graciously received, and granted him a Letter of *Mandamus* to the University of *Oxford* for the Degree of Master of Arts. This Letter was dated the 18th of *November*, 1678.

The same Year he was chosen Fellow of the *Royal Society*, and he gave an ample Confirmation of his just Claim to those Honours, by three Pieces he published relating to the Stars, in the following Year. These Works were scarcely out of the Press when he was pitched upon, by the *Royal Society*, to visit Mr. *Hevelius* at *Dantzic*, that Gentleman having employed himself in preparing a new Catalogue of the fixed Stars, and, observing that it would not be compleat without the Stars near the South Pole, applied to the *Royal Society*, wishing that some skilful Person of that Body might be prevailed upon to execute
that

that Part of his Design. — Our Author, likewise, had a View to adjusting the Dispute betwixt him and Mr. *Hook*, about the Preference of plain, or glass Sights in Astrosopical Instruments. Mr. *Halley* accordingly set out for that City the 14th of *May*, 1679, and arriving there the 26th immediately waited on the Consul, and, after some Conference, agreed to enter upon the Business of his Visit that same Night, on which, and every Night afterwards, the Sky permitting, the two Astronomers made their Observations together 'till the 18th of *July*: When our Author, taking Leave, gave his Opinion of the surprizing Accuracy of the Consul's Observations in a Letter addressed to him.

Returning home to his Father, he continued with him 'till the latter End of the ensuing Year, 1680, when he set out upon what is usually called the *Grand Tour*: He was accompanied by Mr. *Robert Nelson*, his old School-fellow: — They embarked for *Calais*, and, in the Midway from hence to *Paris*, Mr. *Halley* had, first of any one, a Sight of the remarkable Comet, as it now appeared a second Time that Year, and thence gave, as it were, a new *Æra* to the astronomical World. It was, at this Time, in its Ascent or Return from the Sun. He had, the *November* before, seen it in its Descent; and he now hastened to compleat the Gratification of his Curiosity in viewing this extraordinary, and, at that Time, unaccountable Phænomenon, from the *Royal Observatory* of *France*. Our Author's Design, in this Part of his Tour, was to settle a friendly Correspondence between the two Royal Astronomers of *Greenwich* and *Paris*, and, at the same Time, neglect no Means, if any offered, of improving himself, (as he had done before with Mr. *Hevelius*,) by so great a Master as *Signior Cassini*. — From *Paris* our Author went with his Fellow-traveller to *Italy*, where he spent great Part of the Year, 1681, but his Affairs then calling him home, he left Mr. *Nelson* at *Rome*, and returned to *Paris*, where he made a short Stay, and then came to *England*. — He had not been in *England* long before he married *Mary*, Daughter of Mr. *Tooke*, Auditor of the Exchequer, a young Lady equally amiable for the Gracefulness of her Person and the Beauties of her Mind, in whose Society he lived happy for 55 Years, and took up his Residence at *Islington*, where he set up

his Apparatus, his Tubes, Sextant, &c. the Attendants of his darling Employment.

In 1683, our Author published his *Theory of the Variation of the Magnetical Compass*: Wherein he supposes, that the whole Globe of the Earth is one great Magnet, having four magnetical Poles, or Points of Attraction, &c. In this, our Author observed, there were some Things Matter of Difficulty and Uncertainty, and therefore he resolved to spare no Pains to possess himself of all the Observations, relative to it, both abroad and at home: However, his Father's Death, and some other Circumstances, interrupted his Pursuit.

In 1684, he turned his Thoughts upon the Subject of *Kepler's Sesquialterate Proportion*, and after some Meditation, concluded from it, that the centripetal Force must decrease in Proportion to the Squares of the Distances reciprocally. He found himself, however, unable to make it out in any geometrical Way, and therefore, first, applied to Mr. *Hooke*, and Sir *Christopher Wren*, who not affording him the desired Satisfaction, he went to *Cambridge* to Mr. *Newton*, who supplied him fully with what he had so ardently sought. — Mr. *Halley*, having found in him an immense Fund of Knowledge, could not rest 'till he had prevailed upon Mr. *Newton* to enrich the World with it; and to this Interview the World is, in some Measure, indebted for the *Principia Mathematica Philosophiæ Naturalis*. The *Principia* was published in 1686, and Mr. *Halley*, who had the whole Care of the Impression under the Direction of the *Royal Society*, presented it to his Majesty King *James II.* with an introductory Discourse of his own, explaining the astronomical Part of the Book, together with an Elogium in *Latin*.

In 1685, Dr. *William Musgrave*, Secretary to the *Royal Society*, declining to act, our Author was appointed assistant Secretary, in which Place the first Paper that he published was, a Tract of his own, on the Subject of Gunnery: Wherein he discovered some Improvement of this useful Art. This was followed by another, wherein our Author shewed the Method of measuring very high Mountains, Steeples, and other Eminences, by the Barometer.

The next Year, he published a third Tract, by the same Canal, containing both the History and physical Cause of the

Trade-

Trade-winds and *Moonsons*. He likewise published a Chart, representing their Direction, wherever they are found to blow, through all the Parts of the Globe known to the *English* Mariners.

In 1687, our Author undertook to explain the Cause of a natural Phænomenon, which greatly puzzled the ablest Geographers. The *Mediterranean* Sea is observed not to swell in the least, notwithstanding there is no visible Discharge of the prodigious Quantity of Water which runs into it from nine large Rivers, besides several small ones, and the constant setting in of the Current at the Mouth of the Streights. His Solution of this Difficulty gave so much Satisfaction to the Society, that he was requested to prosecute these Enquiries: He did so, and having shewn, by the most accurate Experiments, how that great Increase of Water was actually carried off in Vapours raised by the Action of the Sun and Wind upon its Surface, he proceeded with the like Success to point out the Method used by Nature to return the said Vapours into the Sea. This Circulation he supposes to be carried on by the Winds driving these Vapours to the Mountains, where being collected, they form the Springs which uniting become Rivulets, or Brooks; and many of these again meeting in the Valleys grow into large Rivers, emptying themselves at last into the Sea.

He next ranged into the Field of speculative Geometry, where, observing some Imperfections in the Methods laid down by others for constructing solid Problems, or Equations of the third and fourth Powers; for the better effecting the Purpose, he furnished new Rules, which were both more easy and more elegant than any of the former. Nor did this satisfy him 'till he had proceeded to shew a new Way of finding the Number of Roots in such Equations, as also the Limits of them, and this too by the Help of that particular Curve Line, the Rectification of which, being the first Performance in that Way, was compleated by Mr. *Neile*, and thence called the *Neilian Parabola*.

Mr. *Halley* then undertook to publish a more correct *Ephemeris* for the Year 1688, there being then great Want of proper *Ephemerides* of any tolerable Exactness, the common ones being justly complained of by Mr. *Flamsteed*.

In the Beginning of the Year 1691, he published exact Tables of the Conjunction of *Mercury* and *Venus* with the *Sun*. Dr. *Smith*, Plumian Professor of Astronomy at *Cambridge*; speaking of it, observes, that it contains a most accurate Theory for finding the visible Conjunctions of *Mercury* and *Venus*, with a Specimen thereof, in Tables comprehending all the Times of their Appearance over the Sun's Disk for two Centuries, beginning from the Time of the Invention of Telescopes, and agreeing with the latest and best Observations, to a wonderful Degree of Exactness, some few Errors excepted, which were corrected in a second Publication; and he afterwards shewed one extraordinary Use to be made of those Tables, relating to the Conjunction of *Venus* with the *Sun*, viz. for discovering the Sun's Parallax, and thereby the true Distance of the Sun from the Earth.

In 1692, our Author produced his Tables for shewing the Value of Annuities for Lives, calculated from the Bills of Mortality; and his *Universal* THEOREM for finding the *Foci* of Optic Glasses.

This Year, Dr. *Edward Bernard* resigned the *Savilian* Professorship of Astronomy at *Oxford*: Mr. *Halley* applied for the Place, but did not succeed. Bishop *Stillingfleet* was desired to recommend him at Court, as a proper Possessor of the Mathematical Chair; but the Bishop refused it, as knowing he was not an orthodox Christian.

Leisure now favoured his former Intentions, of making all the requisite Observations for ascertaining the Variations of the Needle: To this End, he procured an Application to be made to King *William III.* who appointed him Captain of the *Paramour* Pink, with proper Assistants; and in this Voyage he proceeded so far as to cross the Line, and traversed the vast *Atlantic* Ocean from one Hemisphere to another; and, in his Way back touched at *St. Helena*, the Coast of *Brazil*, *Cape Verd*, *Barbadoes*, *Madeiras*, the *Canaries*, the Coast of *Barbary* and many other Latitudes: He set out on this Voyage in 1698, and returned in 1700, and having by this Means furnished himself with a competent Number of Observations, he published, in 1701, a general Chart, shewing, at one View, the Variation of the Compass in all those Seas where the *English* Navigators were acquainted.

The *Captain*, for he had now acquired that Title and Character, had not been at home little more than half a Year before he went out in the same Ship, with Commission from the King to observe the Course of the Tides in every Part of the *British Channel* at home, and to take the Latitude and Longitude of the principal Head Lands; which Orders were executed with his usual Expedition and Accuracy: And, in 1702, he published a large Map of the *British Channel*.

In 1703, the Emperor of *Germany* sent for him to fix on a proper Place for making a commodious Harbour on the *Adriatic Coast*; but some Opposition being made to it by the *Dutch*, the Design was laid aside. The Emperor nevertheless received him with Marks of high Esteem, and, besides other Gratuities, presented him with a Diamond Ring from his own Finger. — He was likewise received with great Respect by the King of the *Romans*, Prince *Eugene*, and the principal Officers of the Court. — He was sent a second Time on the like Business by her Majesty Queen *Ann*; and, upon his Return to *England*, Dr. *Wallis* being deceased, he was appointed *Savillian* Professor of Geometry at *Oxford*; and, by the unanimous Voice of the University, had the Degree of Doctor of Laws conferred upon him. In 1706, he was employed, at the Request of Dr. *Aldrich*, in the Translation of *Apollonius* from the *Arabic* into *Latin*, and some other foreign and curious Pieces in the mathematical Science.

Very soon after he had finished this Business, to the great Satisfaction of the Learned, in 1708 he published the *Miscellanea Curiosa*, containing several of his own, as well as many curious Discoveries and Observations of others, which had come under his Notice.

November 13, 1713, he succeeded Doctor, afterwards Sir *Hans Sloane*, in the Office of Secretary to the *Royal Society*. And, as perfecting the Theory of the Moon's Motion was always uppermost in his Thoughts, and to which he devoted great Part of his Time, he was now bent upon compleating of it: And in the Year 1715, he finished it so far as this Theory regarded the Syzigies or Conjunctions. By this Means he not only predicted, within a very few Minutes, the central Eclipse of the Sun, which happened that Year, but drew a Map likewise
wherein

wherein the Extent of the Moon's Shadow was represented to a wonderful Degree of Exactness, as was verified by the Event, and more so than that of Mr. *Whiston's*, or the Royal Astronomer: His Merit therefore became universally acknowledged; so that upon the Death of Mr. *Flamsteed* in 1719, Dr. *Halley* was appointed to succeed him as *Regius Professor* of Astronomy at *Greenwich*.

The Doctor now saw himself in one of the most agreeable, as well as advantageous Situations; here he was not only provided with the best Conveniencies, but had his Royal Master's Command to pursue that Study, and compleat that Theory of the Moon's Motion, which had been his constant Wish. He immediately fixed a Transit Instrument upon the Meridian, and pursued his Views with singular Assiduity: And though he was then in the sixty-fourth Year of his Age, a Time of Life when *Cicero* said of himself, in the Words of *Plautus*, *Life is almost over with me*; and yet Dr. *Halley* attended his Telescope, without any Assistance, for eighteen Years afterwards; in all which Time he scarce lost a Meridian View of the Moon, whether by Day or by Night, when the Heavens would permit. That he might have no Avocation from this Work, he resigned the Post of Secretary to the *Royal Society* in 1721, and the next Year he began to take the right Ascensions of the Moon, with his Transit Instrument, 'till the celebrated Mural Arch was finished at the Public Expence in 1725, by which he was enabled to determine their Longitudes from Observation.

Upon the Accession of his late Majesty to the Throne, his Consort Queen *Caroline* thought proper to make a Visit to the Royal Observatory, and, being pleased with every Thing she saw, took Notice, that Dr. *Halley* had formerly served the Crown as Captain in the Navy, and soon after obtained a Grant of his Half-pay for that Commission, which he enjoyed from that Time during Life: An Offer was also made him, of being mathematical Preceptor to the Duke of *Cumberland*, but he declined that Honor by Reason of his great Age, and because he deemed the ordinary Attendance upon that Employ would be inconsistent with the Performance of his Duty at *Greenwich*.

In 1729, he was admitted a foreign Member of the *Academy of Sciences* at *Paris*, in the room of Signior *Bianchini*. ——— About the

The Life of EDMUND HALLEY. 441

the Year 1737, he was seized with a paralytic Disorder in his Right-hand; however, he came as usual, once a Week, to visit his Friends in Town the *Thursday* before the Meeting of the *Royal Society*, and continued to do so 'till within a few Months before his Death: Nor did he neglect his Mural Arch 'till the End of the Year 1739, when, having compleated his third *Plinian* Period, he there closed this important Work; and soon after his Strength visibly declined, and he came at Length to be wholly supported by such Cordials as were ordered by his Physician, Dr. *Mead*, 'till being tired with these, he asked for a Glass of Wine, and, having drank it, presently expired, as he sat in his Chair, without a Groan, on the 14th of *January* 174 $\frac{1}{2}$, in the 86th Year of his Age: His Corpse was interred at *Lee* near *Greenwich*, with this Inscription:

Sub hoc marmore
Placide requiescit cum uxore Charissima
 EDMUNDUS HALLEIUS, LL.D.
Astronomorum sui seculi facile princeps:
Ut vero scias lector
Qualis quantusque vir ille fuit,
Scripta ejus multifaria lege:
Quibus omnes fere Artes et Scientias
Illustravit, Ornavit, Amplificavit.
Æquum est igitur,
Ut quum cives sui virum
Tantopere coluerè,
Memoriam ejus posteritas
Grata veneretur.
 Natus } est A. C. { MDCLVI.
 Mortuus } MDCCXLI.
Hoc saxum optimis parentibus
Sacrarunt duæ filiæ pientissime.
Anno C. MDCCXLII.

1741
 1656
 85 2/3

As to Dr. *Halley's* Person, he was of a middle Stature, inclining to Tallness, of a thin Habit of Body, fair Complexion, and always spoke, as well as acted, with an uncommon Degree of Vivacity. As he was a Member of the *Royal Academy of Sciences*,
 4 O whose

whose Name was esteemed an Honour to it, Mr. *Marian* read an Eloge of him before that Academy, in 1742, wherein he gives an Oratorical Account of the Universality of his Genius in his *History of the Trade-winds and Monsoons*: ——— *His Estimation of the Quantity of Vapours which the Sun raises from the Sea*: ——— *The Circulation of Vapours, the Origin of Fountains*: ——— *The Nature of Light and transparent Bodies*: ——— *Adjusting the Value of Annuities, from a Calculation of the Degrees of Mortality*: and many other Works, in which almost all the Sciences, Astronomy, Geometry and Algebra, Optics and Dioptrics, Balistics, and Artillery, speculative and experimental Philosophy, Natural History, Antiquities, Philology and Criticism, being near thirty Dissertations, which he produced during his Residence in *London*, and all abounding with Ideas new, singular, and useful: Remarks in particular the Boldness and Sublimity of his Philosophical Hypothesis, that, as he was not afraid to oppose popular Opinions, conceiving and proposing Hypothesis without the least Scruple, forming Conjectures from his own Observations and particular Apprehensions; so to his Boldness frequently fortunate, the World now stands indebted for the admirable Theory of the Variation of the Compass, and the greater Part of his other Discoveries which have so much contributed to the Advancement of Learning. ——— As he embraced the common Opinion concerning the Reality and Infinity of Space, he concludes the Number of Stars to be infinite, upon the Principles of mutual Attraction, which must immediately unite them in one common Centre, unless balanced every where and to Infinity, an Opinion long ago maintained by *Lucretius*. To which we may add, the Doctor's Account of the Infinity of the System of the World, from the *Philosophical Transactions*, N^o. 364, where he tells us, that the System of the World is now understood to occupy the whole Abyss of Space, and consequently be actually infinite; and smaller fixed Stars being still discoverable, as more perfect Telescopes are employed, seems to confirm this Doctrine. That if the whole System were finite, it would, though ever so extended, still occupy no Part of the *Infinitum* of Space, which necessarily and evidently exists: Whence the whole World would be surrounded with an infinite *Inane*, and the superficial Stars would gravitate towards those
near

near the Center, and, with an accelerated Motion, run into them, and in Process of Time unite into one. But if the whole be infinite, all the Parts of it would be nearly in *Equilibrio*; whence each fixed Star, being attracted by contrary Powers, would keep its Place, or move till, from such an Equilibrium, it comes to rest. It is no more absurd, that the fixed Stars should exceed any given Number, than that Duration should be eternal; because no Number of Days and Years can compleat it. ——— It is said, I know, continues the Doctor, that if the Number of the fixed Stars were more than finite, the whole Surface of their apparent Sphere would be luminous. But if we suppose all the fixed Stars to be as far from one another, as the nearest of them is from the Sun; that is, if we may suppose the Sun to be one of them; at a greater Distance their Disks and Light will be diminished, and the Space to contain them increased in Proportion of the Squares; so that in each spherical Surface the Number of Stars it might contain will be as the Biquadrate of their Distances. If then, as it needs must, the Distances be immensely great, it will follow, that as the Light of the fixed Stars diminishes, the Intervals between them decrease in a less Proportion; the one being as the Distances, the other as the Squares thereof reciprocally. And the more remote Stars are so small, that they must vanish even in the most exquisite Telescopes, as a small Telescopic Star is invisible to the naked Eye.

To conclude: Dr. *Halley*, says this Eloge Writer, possessed all the Qualifications necessary to the Astronomer, the Naturalist, the Scholar and the Philosopher; abundantly sufficient to merit the Approbation of Princes, and the Applause of the Learned: His extensive Knowledge always joined with a Presence of Mind and Freedom of Expression, at the same Time pertinent, judicious, polite, and sincere: He was open and punctual in his Dealings, candid in his Judgment, blameless in his Manners, sweet and affable in Conversation, communicative and disinterested: He always spoke of others with due Difference to their Merit, however they may in some Respects differ from him in Sentiment; and this happy Disposition was the more perfect, as it was still attendant upon that Peace of Mind which is the noble Endowment and Reward of Virtue.

The LIFE of JOHN LE CLERC.

JOHN LE CLERC, a celebrated Historian, Philosopher and Critic, was born at *Geneva* the 19th of *March*, in the Year 1657: His Father, *Stephen Le Clerc*, was a learned and eminent Physician of *Geneva*, afterwards made *Greek* Professor in that Academy, and Senator of the Republic: He took great Care of his Children's Education, and *John* was sent to a Grammar-School at eight Years of Age, where he soon discovered a prodigious Inclination to Books, and such a Genius for Poetry, that, as he tells us himself, if he had duly cultivated it he would probably have gained no small Reputation that Way. We have some Specimens of his Talents that Way; for having translated two Sermons of Bishop *Burnet's*, preached before King *William*, into *French*, he subjoined to one a small Poem in Heroic, and to the other an Epigram in Elegiac Verse, *de Anglia liberata*, that is, upon *England* restored to Liberty. However, our Author determined to pursue more serious Studies, and to neglect the Amusements of Poetry.

When he was about sixteen Years of Age, he was removed from the Grammar-school and placed under the Care of Mr. *Chovet*, a very learned Man, to Study Philosophy: And in this he spent two Years, but did not yet enter upon the Study of Divinity, thinking it better to employ another Year in perfecting himself in the *Belles Lettres*, and in acquiring the Principles of the *Hebrew* Tongue, and made it his Study with close Application. — At 19 Years of Age he began to study Divinity under *Philip Mesrezat*, *Francis Turretin*, and *Lewis Tronchin*, and attended their Lectures above two Years, and went through all the usual Forms of Study to qualify himself for the Dignity of the Priesthood. But about this Time, many theological Disputes arose about the Universality of Grace and the Efficacy of Christ's Death, and other Points, Controversies betwixt the *Calvinists* and *Armenians*, which engrossed our Author's Attention; and, in order to determine the Points in Debate, he not only read the Scriptures in the Original, but wrote Notes and Commentaries thereon; and Polemial Subjects, for a considerable

ble Time, employed his Thoughts and Pen, in which he discovered his great Learning and Criticism. However, as he did not favour the orthodox Scheme, he was not in the Way of Preferment.

In the Year 1682, he came over to *London*, partly to perfect himself in the *English* Tongue, where he continued about a Year, then went back to *Holland*; but he had not been long there before his Friends solicited him to return to *Geneva*, but the Dissonance of his Opinions rendered his public preaching Dissatisfactory to the governing Party, and, in 1684, when the Remonstrants held a Synod at *Rotterdam*, he preached once more before them, and was then admitted Professor of Philosophy, the *Hebrew* Tongue, and polite Literature, in their School at *Amsterdam*. From this Time to 1690, the Historians of his Life furnish us with little else than an Account of his Works, chiefly on controversial Subjects; but all this Time he continued to read regular Lectures, as Professor of Philosophy and the *Belles Lettres*, to the University of *Amsterdam*: And, because there were no single Authors who appeared clear and full enough for this Purpose, he drew up some Treatises himself, and published, in the Year 1691, his Treatise of Logic, Ontology and Pneumatology: And, to compleat his Course, in 1695 he published his *Natural Philosophy*, a Treatise in great Esteem for many Years, and may still be read to Advantage by those who would have a general Idea of the Science in such Parts as are not enveloped in *Mathematical Demonstrations*. He had dedicated his Logic to the Hon. *Rob. Boyle*, but that great Philosopher dying before it came to his Hands, he addressed it in the next Edition to his Friend Mr. *Lock*. These Philosophical Works were written in *Latin*, and underwent several Impressions: But these appear to be the principal Books which he wrote on these Subjects. We shall only just mention some others, as an Instance of his Universal Learning, great Application to Study, and constant Endeavours to be generally useful by his Publications, viz. his Commentaries on the Books of the *Old* and *New Testaments*: — His *Ars Critica*: — History of Ecclesiastical Writers: — A Compendium of Universal History: — The Life of Cardinal *Richlieu*: — A Translation of Dr. *Hammond's* Paraphrase on the *New Testament*, with Notes: — His *Har-*
monica

monica Evangelica: — His *Parthasiana*; or, Thoughts upon Religion, History, Poetry, Morals, and Politics: — An Edition of *Hesiod*: — A *French* Translation of the *New Testament*: — *Bibliothèque ancienne* and modern: — An elegant Edition, with Notes, of *Grotius de Veritate*: — A Defence of *Tindal's* Rights of the Christian Church: — A new Edition of *Livy*, and a Variety of other Miscellaneous Tracts, — besides a large historical Dictionary.

His Works every where abound with good Sense and sound Learning, and the greater Part of them will be valued while Liberty and Literature shall maintain their Ground in *Europe*. He always enjoyed a pretty good State of Health 'till the Year 1728, when he was seized with a Palsy and Fever, and was more or less afflicted 'till his Death, the 8th of *January*, 1736, in the 79th Year of his Age. He was married in the Year 1691, and had four Children, who died young. *Le Clerc* was much esteemed for his Candour and Integrity as well as Learning; neither ambitious of Riches or Honours, and though he had uncommon natural Parts, as well as Acquirements, yet we do not find that the Love of Fame, or Vain-glory, ever tempted him to play loose with his Friends, or with Truth: Satisfied with a Competency of Fortune, he always appeared to be happy in the studious and philosophic Ease which he enjoyed at *Amsterdam*, dividing his Time between his Books and his Pupils. Upon the Whole, History must perpetuate his Memory as a truly valuable Man, and as the Friend of Religion and Learning.

The LIFE of WILLIAM DERHAM.

WILLIAM DERHAM, an eminent *English* Philosopher and Divine, was born at *Stowton*, near *Worcester* upon the 26th of *November*, 1657, and educated in Grammar Learning at *Blochley* in that County: Upon the 4th of *May*, 1675, he was admitted into *Trinity College, Oxford*, and, by the Time he took his Bachelor's Degree, was greatly distinguished for

for his Learning in the Languages, for his Genius in philosophical Enquiries, and for other Eminent Qualifications. He was ordained Deacon by Dr. *Compton*, Bishop of *London*, May 29, 1681, and Priest by Dr. *Seth Ward*, July 9, 1682, and was soon after presented, by Mr. *Neville*, to the Vicarage of *Wargrave* in *Berkshire*, where he continued about seven Years, and on the 31st of *August*, 1689, he was presented by Mrs. *Jane Bray*, to the valuable Rectory of *Upminster* in *Essex*: This Living being situate at a convenient Distance from *London*, afforded him an Opportunity of conversing and corresponding with the greatest Virtuofos of that City, in the philosophical Sciences; besides those, he likewise held a Correspondence with many other ingenious Gentlemen: And as he was then placed in a Retirement suitable to his contemplative and philosophical Genius, he applied himself, with great Eagerness, to the Study of Nature, and to Mathematics and Experimental Philosophy, in which he became so eminent, that he was soon after chosen Fellow of the *Royal Society*; and he proved one of the most useful and industrious Members of it, frequently publishing, in the *Philosophical Transactions*, curious Observations and valuable Pieces, besides various other occasional and miscellaneous Dissertations: In particular, his Registers and Observations of the Weather at *Upminster* for several Years, compared with other Observations communicated to him from Correspondents in other Places:—— Variety of Calculations of Eclipses, and other Phænomena. The following are reckoned the Principal:

1. Experiments on the Motion of Pendulums in *Vacuo*.
2. A Description of an Instrument for finding the Meridian.
3. Experiments and Observations on the Motion of Sound.
4. On the Migration of Birds.
5. An History of the Spots in the Sun, observed from 1703 to 1711.
6. Observations on the *Lumen Boreale*, or Northern Lights, Oct. 8, 1726.
7. Tables of the Eclipses of *Jupiter's* Satellites.
8. The Difference of Time in the Meridian of different Places.

9. A Letter to Sir *Hans Sloane*, giving an Account of some uncommon Appearances observed in an *Aurora Borealis*, Oct. 13, 1728.

10. Of the Meteor called *Ignis Fatuus*.

11. The History of the Death Watch.

12. A Treatise of Watch and Clock-work: With many new and curious Improvements.

In the Year 1711, he preached sixteen Sermons at Mr. *Boyle's* Lecture, which he digested in another Form, and published under the Title of *Physico-Theology*; or, *A Demonstration of the Being and Attributes of GOD, from his Works of Creation*. And, in Pursuance of the same Design, in 1714, he published *Astro-Theology*; or, *A Demonstration of the Being and Attributes of GOD, from a Survey of the Heavens*. — These Works are highly valued, and have passed through several Editions.

In the Year 1716, he was made a Canon of *Windsor*, being at that Time Chaplain to his late Majesty, then Prince of *Wales*, and in 1730, received the Degree of Doctor of Divinity from the University of *Oxford*, on Account of his Learning, and the Service he had done to Religion by his Culture of natural Knowledge. — When *Eleazar Albin* published his natural History of Birds and *English Insects*, in 4 Vols. 4to. with many beautiful Cuts, it was accompanied with very curious Notes and Observations by our learned Author: And he likewise revised the *Miscellanea Curiosa*, published by Dr. *Halley* in 3 Vols. 8vo. — The last Thing he published of his own Composition was entitled, *Christo-Theology*; or, *A Demonstration of the divine Authority of the Christian Religion*. — But, besides his own, he published some Pieces of the famous Mr. *Ray*, revising and correcting the Author's Manuscripts. — To him the World is likewise indebted, for the Publication of the *Philosophical Experiments* of the late eminent Dr. *Hooke*, and other Ingenious Men of his Time.

Thus this great and good Man, having spent his Life in the most agreeable and improving Study of Nature, and made all his Researches therein subservient to the Cause of true Religion and Virtue, died, at length, in his 78th Year, upon the 5th of April, 1735, at *Upminster*, where he was buried. He left be-
hind

hind him a valuable Collection of Curiosities; among the rest he had collected a Specimen of Insects and of most Kind of Birds, of which he had preserved the Male and Female. — It may be proper, likewise, to observe, that Dr. *Derham* was very skillful in medical, as well as philosophical and theological Knowledge, and was a constant Physician to the Bodies as well as the Souls of his Parishoners.

The LIFE of the MARQUIS DeL'HOSPITAL.

WILLIAM-FRANCIS-ANTHONY, Marquis *De L'Hospital*, a most eminent Mathematician of *France*, was born of an ancient and illustrious Family in the Year 1661: His Genius for mechanical and mathematical Studies very early discovered itself, that he was thought a Prodigy in Nature: For being one Day at the Duke of *Roan's*, where some able Mathematicians were speaking of a Problem of Mr. *Pascal's*, which appeared to them extremely difficult, he ventured to say he believed he could solve it: This was construed an Instance of Presumption in a Youth of no more than 15 Years of Age. Nevertheless, in a few Days he sent them the Solution. He discovered likewise a sprightly, active Genius, qualified for military Atchievements; and therefore entered himself very early into the Army, and discharged his Duty in several Ranks and Characters with Applause; so that he was at Length advanced to the Dignity of Captain of Horse. But still our Author preserved his Love for the mathematical Science, and took every convenient Opportunity to improve in the Study of it: But in this there was some Difficulty which he laboured under; for it was thought derogating from the Dignity of a Nobleman, and inconsistent with the Character of a Soldier, to pursue such Studies: So that, as a Soldier, he was in some Measure obliged to conceal his Application to Study, and his Attainments of that Kind. However, as it stood somewhat in Competition with his military Dignity,

Dignity, and as being short-sighted, was on that Account exposed to great Inconveniencies while he was Captain of Horse; and, withal, having an independent Fortune, he quitted the Army and applied himself entirely to his favourite Amusement. He then contracted a Friendship with *Malbrank*, judging him to be an excellent Guide in the Sciences, and, accordingly, took his Opinion and Advice upon all Occasions; and corresponded with other Persons famous for those Studies, in order to facilitate his Improvement. His Abilities soon became more conspicuous, and at the Age of Thirty-two, he gave a public Solution of some Problems drawn from the deepest Geometry which had been proposed to the Mathematicians in the Acts of *Leipsic*.

In 1693, he was received an honorary Member of the *Royal Academy of Sciences* at *Paris*, and gave some Proofs of his great Skill in Mathematics. — He published a Work intitled *Analyse des infiniment Petits*, built upon Sir I. NEWTON's Doctrine of *Fluxions*. He was the first in *France* who wrote upon this Subject; and, on this Account, it met with no small Regard. He engaged afterwards in another mathematical Work, in which he included “*Les Sections Coniques, les lieux Geometriques, & la Construction des Egalités*.” This he prepared for the Press, but he did not live to publish it, being seized with a Fever, of which he died on the 2d of *February*, 1704, aged 43 Years. It was published after his Decease, and very well received. His Character was that of a candid, ingenious Friend, justly valued, and his Loss generally regretted by those who had the Happiness of his Acquaintance.

The LIFE of JOHN HUDSON.

JOHN HUDSON, a very learned Critic and Philosopher, was born at *Widehope*, near *Cockermouth* in *Cumberland*, in 1662; after having had a Grammar Education in that Neighbourhood, he was sent, at the Age of fourteen, to *Queen's College, Oxford*, where he made a great Progress in Philosophy and

and polite Literature, under the Tuition of Mr. *Thomas Crosthwaite*: He took the Degree of Bachelor of Arts, *July 4, 1681*; and that of Master, *February 12, 1684*; and, according to the regular Times, having taken his last Degree, he removed to *University College*, of which he was chosen Fellow, *March 29, 1686*: On the 5th of *June, 1701*, he accumulated the Degrees of Bachelor and Doctor in Divinity, having the *April* before been appointed Head Keeper of the *Bodleian Library*. In *1712*, he was appointed Principal of *St. Mary Hall*, by the Chancellor of the University, at the Request of *Dr. Ratcliffe*; and to *Dr. Hudson* is the University obliged, from the most ample Benefaction she received from *Dr. Ratcliffe*, whose Advice and Persuasion determined him thereto. — The principal and truly valuable Part of our Author's Employment was, publishing some Translation and curious Editions of the best ancient Writers in History and Philosophy, some of them interspersed with Notes. The last which he employed his learned Pains about was, *Josephus*, whom he just finished, but did not live to publish. His studious and sedentary Way of Life, and too great Abstemiousness withal, brought him into an ill Habit of Body, which turned to a Dropsy, of which he died, *Nov. 27, 1719*, aged 58, at *St. Mary Hall*, and was buried in the Chancel of that Church, where there is a Stone, with a very short Inscription, mentioning only his Name, Age, and Date: He left one Daughter, besides his Widow, who was afterwards married to *Dr. Hall*. Such, to the great Loss of Learning, was the too early Period of this great Man, who, if he had lived, had probably obliged the World with many curious Productions, and assisted others in sending their valuable Pieces into the World. He was a great Assistant in that Respect to *Dr. Gregory*, in his Edition of *Euclid's Works*. He kept up a friendly and useful Correspondence with many of the most considerable Persons abroad, in *Italy, France, Sweden, Denmark, and Holland*; in a Word, he was in so great Repute abroad, that he frequently complained of the Expences attending it; but his Love of Learning was superior to that Disadvantage. He was a Man of great Probity, of a sanguine Complexion, a handsome agreeable Countenance, of moderate Stature, and

very good Constitution, 'till he impaired it by incessant Study and Application.

The LIFE of DAVID GREGORY.

DAVID GREGORY, Nephew of that celebrated Philosopher and Mathematician *James Gregory*, (see his Life, p. 349.) was born at the said Town of *Aberdeen*, Jan. 24, 1661, where he also received the first Rudiments of his Learning; but was afterwards removed to *Edinburgh*, and took his Degree of Master of Arts in that University. The great Advantage of his Uncle's Papers was both an Incitement and Introduction to the mathematical Study, for which he was likewise qualified by a natural Subtlety of Genius, to which he applied with indefatigable Industry, and succeeded so well, that he was advanced to the mathematical Chair at *Edinburgh* at the Age of twenty-three: And the same Year he published a Treatise entitled, *Exercitatio Geometrica de Dimensione Figurarum*, *Edin.* 1684, 4to. wherein, assuming the Doctrine of Indivisibility and the Arithmetic of Infinites as already known, he explained a Method which not only suited his Uncle's Examples, left by him without any Way of finding them, but discovered others whereby an infinite Number of Curve Lines, and the Areas contained between them and Right Lines, might be measured.

Not long after he had been promoted to the Chair in that University, in the Execution of this Office, he was the first that introduced the *Newtonian* Philosophy into the Schools, having first made himself so thoroughly acquainted with it, as to be able to read his Professorial Lectures upon the Philosophy contained in it; and he continued to read his Lectures, with great Applause, 'till the Year 1691; but after the breaking up of the College for the long Vocation that Year, he left *Scotland*, and coming to *London*, (partly on the News of Dr. *Bernard's* Intention of resigning the *Savilian* Professorship of Astronomy at *Oxford*,) he was introduced to Sir *Isaac Newton*, then intent upon bringing the Theory of the Moon to greater Perfection: That

That great Man, according to his native Modesty and Candour, soon conceived a good Opinion of Mr. *Gregory's* Abilities, and, by his Recommendation, was made a Fellow of the *Royal Society, London*. He likewise recommended him to Mr. *Flamsteed*, (Master of the mathematical School in *Christ's Hospital*,) as a Person qualified to succeed Dr. *Edward Bernard* at *Oxford*. Thus recommended, the Royal Astronomer used his best Endeavours to procure him Success at *Oxford*, where he was elected Astronomy Professor this Year, having been first admitted of *Baliol College*, and incorporated Master of Arts, on the 8th of *February*; and he was created Doctor of Physic on the 18th of the same Month. He had no Relish for the technical Part of his Profession, and was seldom seen in the Observatory; his Genius lay more to Geometry, in which he succeeded very well. His *Elements of Optics* he printed at *Oxford* in 1695. In the Preface he informs us, that these Elements are the Substance of some of his public Lectures at *Edinburgh*, eleven Years before. In this Book he considers these Branches of Optics chiefly with a View to the Construction of Telescopes, and particularly the two reflecting Ones, that of his Uncle *James Gregory* and that of Sir *Isaac Newton*, giving the Preference to the Latter, he had brought his Design into a small Compass, and the Demonstrations being very neat and easy, the Book was in much Esteem.

In 1697, our Author was the first who gave a Demonstration of that Curve which is well known since by the Name of *Catenaria*, or the Curve that is formed by a Chain fastened at each End, and first discovered that this Curve, inverted, gave the Form of a true and legitimate Arch, all the Parts supporting each other, because in their Thickness some *Catenaria* is included. But his most celebrated Performance appeared in 1702, entitled, *Astronomiæ Physicæ & Geometricæ Elementa*. The chief and the most useful Part of his Design in this Treatise is, to explain Sir *Isaac Newton's* Geometry of the *Centripetal* Forces, as far as his Discoveries in Astronomy were built upon it, and to throw the astronomical Part of Sir *Isaac's Principia* into a new and more intelligible Form: And our Author's Merit, in the Performance, received its most distinguished Lustre from the particular Attestation given to it by that incomparable Person himself,

himself, who communicated to him his Theory of the Moon, after he had improved it to the greatest Exactness from Mr. *Flamsteed's* Observations.

In the Year, 1703, our Author published a Folio Edition of *Euclid's* Works in *Greek* and *Latin*. The undertaking had been begun by his Predecessor, Dr. *Edward Bernard*, as the best Specimen that could be given of his great and noble Design he had formed of printing the Works of all the ancient Mathematicians. In the Preface, after a short Summary of his Life, the Doctor proceeds to inform his Readers, that he had inserted into this Collection every Thing that had been ascribed, by any considerable Mathematician, to that Author: As likewise of his Pieces, excluding such only as he thought spurious: Among others, condemning *Euclid's Catoptrics* as not at all suited to *Euclid's* Character: And, in Pursuit of the same Design, our Author engaged not long after with his Colleague, Dr. *Halley*, to publish *Apollonius's Conics*; but was prevented from compleating his Share of the Work by his Death, which happened on the 10th of *October*, 1710, being then retired to *Maidenhead* in *Berkshire* for the Recovery of his Health, where his Body was interred; and a handsome marble Monument is erected to his Memory in *St. Mary's Church* there, with this Inscription:

P. M.
DAVID GREGORII, M. D.
Qui
Aberdenia natus Jan. 24, 1661;
In Academia Edinburgensi,
Matheseos Prælector Publicus.
Deinde Oxonii
Astronomiæ Professor Savilianus.
Obit Oct. 10, A. D. 1710,
Ætatem illi heu brevem Natura Concessit
Sibi ipse longam prorogavit
Scriptor Illustris.
Desideratissimi viri
Elizabetha Uxor
M. P.

The Life of UNSOINE PARENT. 455

He was succeeded in the *Savilian* Professorship by Mr. *John Caswell*, A. M. of *Hart Hall*, now *Hertford College*, in *Oxford*. He left a Widow and several Children: His eldest Son, *David Gregory*, D. D. was first a Student, and since a Canon of *Christ Church*, and was appointed *Regius Professor* of Modern History at the Institution thereof by King *George I.*

Besides the Commentary our Author left upon Sir *Isaac's Principia*, he likewise left a Treatise upon Fluxions: — Another of Trigonometry, both plain and spherical: And a third upon Mechanics and Hydrostatics. — He published, in his Life-time, several Papers in the *Philosophical Transactions*, viz. a Scheme of the Phases, with his Observations on the Sun's Eclipse, *Sept. 13, 1699*, N°. 256: A Paper *De Orbita Cassiniana*, N°. 293: — Some Improvements relating to the Quadrature of the Parts of *Hippocrates's Lunula*, in a Letter to Dr. *Wallis*, N°. 259.

Since his Death there has been published, his *Prælectiones de Motu*, &c. And, in 1745, Mr. *Colin Maclaurin*, a Successor of our Author in the mathematical Chair at *Edinburgh*, published another Piece of his under the Title of *Practical Geometry*: These are the principal of his Works, which do Honour to his Memory, which are generally spoken of with high Esteem by those who were well acquainted with his great Abilities, and the Improvements he had made in the philosophical and mathematical Sciences.

The LIFE of Monsieur PARENT.

ANTHONY PARENT, a learned *French* Mathematician, was descended of a Family originally settled at *Chartres*: But his Father was born at *Paris*, as was also our Author, *Sept. 16, 1666*: Before he was three Years of Age, his maternal Uncle at *Chartres* took him to his House, and became his Preceptor: Among other Things he taught him Writing and the first Rules of Arithmetic; but our Author soon run beyond what his Uncle could teach, for which he was beholden to Books, which he

run through with Avidity and Penetration. His Method of Study was to write Remarks upon the Margin of the Books he read, and he had filled many of these with a Kind of Commentary at the Age of Thirteen.

At the Age of Fourteen, he was put under a School-master at *Charters*, who taught several Branches of the Mathematics, and here he made some Proficiency, first, in Rhetoric; but was afterwards, with much Pleasure to himself, taught the Art of Dialling, and discovered such Penetration with Respect to the Circles of the Sphere, and forming Sun-Dials, that he soon after wrote a Treatise on *Gnomonics*.

At Length his Friends sent him to *Paris*, and enjoined on him the Study of the Law: and, in Obedience to them, he went through a Course in that Faculty; but this was no sooner finished, than, impelled by his predominant Passion for the Mathematics, he returned to the Study thereof, in Spite of all Opposition: And shut himself up in a Room of the College of *Dormans* with less than 200 Livres a Year, where he lived in that Retreat for some Time, from which he never stirred out but to the Royal College in order to hear the Lectures of *M. de la Hire*, or *M. de Sauveur*, under whom he made great Improvement: And it was not long after that he had made himself so well acquainted with Arithmetic in all its Branches, Fortification and Navigation, &c. that he commenced a Master, and taught several Pupils with great Ease and Satisfaction. He soon after began to entertain some Scruple about teaching what he had never seen, and knew by the Force of Imagination only. He imparted this Delicateness to *M. Sauveur*, and that Friend recommended him to the Marquis *d'Aligre*, who at that Time wanted a Mathematician with him. Mr. *Parent* was therefore made choice of, and he went two Campaigns with the Marquis, instructing him in the Nature of the several Fortifications he saw, and drawing Plans of many of them.

From this Time, his Life was spent in a continual Application to the Study of natural Philosophy and the Mathematics, in all its Branches, both speculative and practical, to which he joined Anatomy, Botany, and Chemistry; for his Assiduity in Study was very remarkable.

M. de Billettes being admitted into the Academy of Sciences at *Paris*, with the Title of their Mechanician, he chose *M. Parent* for his Assistant, who excelled chiefly in Mechanics; and in this Station he discovered a Genius for all the various Subjects of this Nature that were brought before them; but withal, he had a natural Preceptancy and Impetuosity of Temper that raised frequent Disputes and Contradictions, and rendered his Extent of Knowledge far less useful and beneficial to himself and others.

—— However, upon a Regulation of the Academy, by the King's Command, he was appointed Assistant Member for Geometry in 1716: But this Promotion he enjoyed but a short Time, being taken off by the Small-pox on the 26th of *September*, the same Year, in the fiftieth Year of his Age. He was Author of a great many Pieces, chiefly on Mechanics and Geometry.

The LIFE of JOHN KEILL.

JOHN KEILL, an eminent Mathematician and Philosopher, was born *December 1, 1671*, at *Edinburgh*, where he received the first Rudiments of Learning; and being educated in that University he continued there till he took the Degree of Master of Arts. His Genius leading him to the Mathematics, he made a great Progress therein, under Mr. *David Gregory* the Professor there, who had embraced the *Newtonian* Philosophy; and, in the Year 1694, followed his Tutor to *Oxford*, where, being admitted of *Baliol*, he obtained one of the *Scotch* Exhibition in that College. He is said to have been the first who taught Sir *Isaac Newton's* Principles by the Experiments on which they are grounded, and this he did, it seems, by an Apparatus of Instruments of his own providing, and got himself, by that Means, a great Reputation throughout the University. But the first Specimen he gave to the Public of his Skill in mathematical and philosophical Knowledge was, his Examination of Dr. *Thomas Burnet's Theory of the Earth*, which appeared in 1698: It was universally applauded by the Men of Science,

and allowed to be decisive against the Doctor's Theory. To this Piece he subjoined Remarks upon Mr. *Whiston's New Theory of the Earth*; and those Theories being defended by their respective Inventors, drew from Mr. *Keill*, in 1609, an Examination of the Reflections of *The Theory of the Earth*, together with a Defence of the Remarks on Mr. *Whiston's new Theory*. Dr. *Burnet* was a Man of great Humanity, Moderation and Candor, and it was therefore supposed that Mr. *Keill* had treated the Doctor too roughly, considering, likewise, the Disparity of Years between them. Mr. *Keill* however left the Doctor in Possession of that which has since been thought to constitute the great Excellence and Perfection of his Work; and though he disclaimed him as a Philosopher, he allowed him to be a Person of a fine Imagination. To use his own Words, "Perhaps (says he) many of his Readers will be sorry to be undeceived about his Theory; for as I believe never was any Book fuller of Mistakes and Errors in Philosophy, so none ever abounded with more beautiful Scenes and surprizing Images; but I write only to those who might expect to find true Philosophy in it."

The following Year, Dr. *Thomas Millington*, *Sedleian* Professor of natural Philosophy in *Oxford*, who had been appointed Physician in ordinary to King *William*, substituted Mr. *Keill*, as his Deputy, to read Lectures in the public Schools. This Office he discharged with great Reputation, and the Term for enjoying the *Scotch* Exhibition at *Baliol* College now expiring, he accepted an Invitation given him by Dr. *Aldrich*, Dean of *Christchurch*, to reside there.

In 1701, Mr. *Keill* finished and published his celebrated Treatise entitled, *Introductio ad veram Physicam*, which is supposed to be the best and most useful of all his Performances. In the Preface he insinuates, the little Progress that Sir *Isaac Newton's Principia* had made in the World, and says, that though the Mechanical Philosophy was then in Repute, yet in most of the Writings upon this Subject, scarce any Thing was to be found but the Name. This Piece was esteemed so good an Introduction to Sir *Isaac's Principia*, that it not only underwent several Impressions in *England*, but, when the *Newtonian* Philosophy began to be established in *France*, this Piece was translated into *French* and held in great Esteem.

About

About the Year 1708, he was made Fellow of the *Royal Society*, and soon after published, in the *Philosophical Transactions*, a Paper of the Laws of Attraction, and its physical Principles.

—— About this Time, being offended at a Passage in the *Acta Eruditorum* at *Leipsic*, wherein Sir *Isaac Newton*'s Right to the first Invention of the Method of Fluxions was called in Question, he communicated to the *Royal Society* another Paper, in which he asserted the Justice of that Claim. This occasioned some Dispute with Mr. *Leibnitz* on that Point; which terminated in Favour of Mr. *Keill*.

In 1709, Mr. *Keill* was appointed Treasurer to the *Palatines*, and in that Station attended them in their Passage to *New England*: — And soon after his Return, in 1710, upon the Death of Mr. *Caswell*, *Savillian* Professor of Astronomy at *Oxford*, he was chosen to succeed him. — About the Year 1711, several Objections were urged against Sir *Isaac Newton*'s Philosophy in Support of *Des Cartes*'s Notions of a *Plenum*, which occasioned Mr. *Keill* to draw up, and present to the *Royal Society*, a Paper “On the Rarity of Matter, and the Tenuity of its Composition.” But while he was engaged in this Controversy, Queen *Ann* was pleased to appoint him her Decypherer, a Post which his great Penetration and Sagacity was thought to qualify him for. — Soon after this, the University of *Oxford* conferred on him (at the Public Act in 1713,) the Degree of Doctor of Physic; and, in 1715, he published an Edition of *Commandinus*'s *Euclid*, with Additions of his own.

In 1717, he married a Lady for her singular Accomplishments, but who, the Writers of his Life have left us no Account. — In the Year 1718, he published his Introduction *Ad verum Astronomiam*, which Treatise was afterwards, at the Request of the *Duchess of Chandois*, translated by himself into *English*, and, with several Emendations, published in 1721, under the Title of *An Introduction to the true Astronomy: Or, Astronomical Lectures, read in the Astronomical School of the University of Oxford*. In these Lectures we meet with many Instances of his great Understanding in this Science. But these terminate his Labours for the public Good; for he was, this Summer, seized with a violent Fever, which put an End to his Life the 1st of September, 1721, when he was not quite 50 Years of Age.

The LIFE of JAMES KEILL.

JAMES KEILL, a Physician and Philosopher, was the younger Brother of the former, was also born in *Scotland* the 27th of *March*, 1673: He received the first Rudiments of Learning at *Edinburgh*, and then went to *Leyden*, and other Universities abroad, in order to perfect himself in Language and Science; and having completed his Travels, he applied himself, with great Assiduity, to the Study of Anatomy, and, to improve himself therein, diligently attended the Business of Dissections, 'till he was capable of displaying his Skill in public; and began with reading some Lectures in private, to gratify some of his Friends, and afterwards read Lectures of Anatomy both at *Oxford* and *Cambridge*, in the Universities, with great Applause, and had the Degree of Doctor of Physic conferred on him at the University of *Cambridge*. Having some Time before published his *Anatomy of the Human Body*, for the Use of his Pupils, he was invited to settle at *Northampton*, which he accordingly did, as a Physician, and succeeded so well as to gain both Reputation and Fortune, and died at *Northampton* of a Cancer in his Mouth, *July* 16, 1719, in the 46th Year of his Age, and was buried in *St. Giles's Church*, where a handsome Monument was erected to his Memory, by his Brother *John Keill*, to whom he left his Estate; but he survived his Brother *James* only two Years, as we have seen in the preceding Life. — Our Author *James Keill* discovered both his Knowledge, and his great Application to acquire and propagate useful Knowledge, by the following Books which he wrote.

In 1698, he translated into *English*, *Lemery's Chemistry*: — In the *Philosophical Transactions*, N°. 306, he published an Account of the Death and Dissection of *John Bayles* of *Northampton*, reputed to have been 130 Years old: And, in N°. 361, *De Viribus Cordis Epistola*: — In 1708, he published an Account of Animal Secretion, the Quantity of Blood in the human Body, and muscular Motion. He concludes his Preface to this Work with remarking, that the *Vis Attrahendi* which he supposes to take Place in animal Secretion, was asserted by the most famous

famous antient Physicians, as *Hippocrates* and *Galen*; in the same Manner as the Gravitation of the heavenly Bodies one towards another was known to the ancient Philosophers, as well as to *Kepler*, and Sir *Isaac Newton*. Upon the Subject of Animal Secretion, and in explaining the Manner how the Fluids of the Animal Body are separated from the Blood, our Author undertakes to shew, (1.) How they are formed in the Blood before they come to the Place appointed for Secretion. (2.) In what Manner they are separated from the Blood by the Glands. Upon the former Head he shews, that the Blood consists of a simple Fluid, in which swim corpuscles of various Figures and Magnitudes, and endued with different Degrees of attractive Force. Hence he concludes, that of such Particles as the Blood consists of, must the Fluids be composed, which are drawn from it; and as in the Blood the Particles attract one another, and cohere together, so likewise may the Particles of the Fluids which are separated from it: This he proceeds farther to shew to be not only possible, but actually so in several Secretions, as Milk, Urine, &c. From this Principle, that the Blood consists of Corpuscles of various Figures and Magnitudes, and endued with various Degrees of an attractive Power, &c. He attempts to shew the Force of the Air upon the Blood, in breathing, in order to demonstrate that by the Pressure of the Air the Cohesion of the Globules of the Blood is dissolved. After this he shews how the Union of the attractive Particles is hindered near the Heart, and that the Particles which unite first, after the Blood is thrown out of the great Artery, must be such as have the strongest attractive Force; and that such as have the least, must unite last; and all the intermediate ones according to their respective attractive Power, &c. But, for farther Particulars, we must refer the Curious to the Work itself.

The LIFE of SAMUEL CLARKE.

DR. *Samuel Clarke*, one of the greatest Divines that any Age has produced, and an expert Metaphysician and Philosopher, was the Son of *Edward Clarke*, Esq; Alderman of the City of

of *Norwich*, and one of its Representatives in Parliament for several Years, and born there upon the 11th of *October*, 1675: He was instructed in classical Learning at that City, and, in the Year 1691, removed from thence to *Caius* College in *Cambridge*, where his uncommon Genius and Abilities soon began to display themselves. Though the Principles of *Des Cartes* was at that Time the established Philosophy of the University, yet Dr. *Clarke* easily mastered the new System of Sir *Isaac Newton*, and, in order to his first Degree of Arts, performed a public Exercise in the Schools upon a Question taken from thence. And he greatly contributed to the Establishment of the *Newtonian* Philosophy by an excellent Translation of, and Notes upon *Robault's* Physics, which he finished before he was two and twenty Years of Age. The System of natural Philosophy then generally taught in that University, was that written by Mr. *Robault*, founded altogether upon *Cartesian* Principles, and very ill translated into *Latin*. Mr. *Clarke* therefore gave a new Translation, and added to it such Notes as might lead young Students insensibly, and by Degrees, to other and truer Notions than could be found there. “ And this certainly, says Bishop *Hoadly*, was a more prudent Method of introducing Truth, unknown before, than to attempt to through aside this Treatise entirely, and write a new one instead of it. The Success answered exceeding well to his Hopes, and he may be justly esteemed a great Benefactor to the University in this Attempt; for, by this Means, the true Philosophy has, without any Noise, prevailed; and to this Day his Translation of *Robault* is in great Repute. And his Notes the first Directions to those who are willing to receive the Reality and Truth of Things in the Place of Invention and Romance.”

Mr. *Whiston* relates, that in the Year 1697, while he was Chaplain to *Moore*, Bishop of *Norwich*, he met Mr. *Clarke*, then wholly unknown to him, at a Coffee-house in that City, where they entered into a Conversation about the *Cartesian* Philosophy, particularly *Robault's* Physics, which Mr. *Clarke's* Tutor, as he tells us, had put him upon translating. The Result of this Conversation was, says Mr. *Whiston*, that I was greatly surprized that so young Man, as Mr. *Clarke* then was, should know so much of those sublime Discoveries, which were then almost

almost a Secret to all except a few particular Mathematicians: Nor do I remember, continues he, above one or two at the most, whom I had then met with, that seemed to know so much of that Philosophy as Mr. *Clarke*." — Of this Translation of *Robault* there were four Editions in Mr. *Clarke*'s Time, in every one of which he made considerable Improvements.

In this Year, viz. 1697, he applied his Mind to the regular Study of Divinity, and, in order to fit himself for the sacred Function, he studied the *Old Testament* in the original *Hebrew*, the *New* in the original *Greek*, and the primitive Christian Writers. — In 1698, Mr. *Whiston*, being collated by the Bishop of *Norwich* to the Living of *Lowestoff* in *Suffolk*, resigned his Chaplainship, in which he was succeeded by Mr. *Clarke*, who lived, for near twelve Years, in this Station with all the Freedom of a Brother, and an Equal rather than as an Inferior. The Bishop esteeming him highly gave many Proofs of it while he lived, and at his Death gave him the highest Proof of his Confidence, by entrusting him with all the Concerns of his Family, a Trust which Mr. *Clarke* executed very faithfully, to the Satisfaction of all Parties.

In 1699, Mr. *Clarke* published his three practical Treatises on Baptism, Confirmation, and Repentance, which were then, and are still esteemed a very useful Performance. — He likewise published some Reflections on a Book called *Amyntor*. — About the Year 1701, he published his Paraphrase upon the *four Gospels*, and intended to have proceeded in the same Method with the *Acts of the Apostles*; but something accidentally interrupted the Execution of it. — In the mean Time, Bishop *Moore*, his Patron, gave our Author the Rectory of *Drayton* near *Norwich*, and likewise a Lectureship in the City, 'till he was advanced to the Rectorship of *St. James's*: — And in the Year 1704, he was appointed to preach Mr. *Boyle*'s Lecture, and the Subject he chose was, *The Being and Attributes of God*. He succeeded so well in this, and gave such high Satisfaction, that he was appointed to preach the same Lecture the next Year, when he chose for his Subject, *The Evidences of natural and revealed Religion*. These Sermons were first printed in two Volumes, and contained some Remarks on such Objections as had been made by *Hobbes* and *Spinoza*, and other Deniers of revealed

revealed Religion. He attempted this, first, by Arguments *a priori*, which, though it was intended to follow the Objector's Method and shew their Arguments inconclusive, drew on him the Censure of some Critics, as an ambiguous and unnecessary Method: Nevertheless, they have been held in much Esteem, and recommended by some of our most eminent Divines as the best Performance on those Subjects. — In the sixth Edition was added, a Discourse concerning the Connection of the Prophecies of the *Old Testament*, and the Application of them to Christ.

About this Time, Mr. *Whiston* informs us, that he discovered our Author (having read much of the primitive Writers) began to suspect that the *Athanasian* Doctrine of the Trinity was not the Doctrine of those early Ages; especially it was remarked of him, that he never read the *Athanasian* Creed at his Parish Church.

In the Year 1706, he published a Letter to Dr. *Dodwell* on the Immortality of the Soul: But the Controversy did not end here; for the celebrated Mr. *Collins*, coming in as a Second to Dr. *Dodwell*, went much farther into the Philosophy of the Dispute, and indeed seemed to produce all that could be said against the Immateriality of the Soul, as well as the Liberty of human Actions. This enlarged the Scene of the Dispute, into which our Author entered and wrote with so much Clearness and Demonstration as at once shewed him greatly superior to his Adversaries in metaphysical and physical Knowledge, and “I am persuaded, says Bishop *Hoadly*, that as what he has wrote in this Controversy comprehends the Little the Ancients had said well, and adds still more evidence than ever clearly appeared before, expressed in Words that have a Meaning to them, it will remain the Standard of good Sense on that Side the Question, and perpetuate his Memory to Posterity. — Several Letters were between them, with Answers, &c. — But in the Midst of all these Labours, Mr. *Clarke* found Time to shew his Regard to mathematical and physical Sciences, and his accurate Knowledge in them, and his natural Propensity for those Studies, laid, as it were, a Foundation for his greater Improvement: But what more than common facilitated his Improvements therein was, his friendly Acquaintance with the incomparable Sir *Isaac New-*

ton, at whose Request he translated his *Optics* into *Latin* in 1706: With this Version Sir *Isaac* was so highly pleased, that he presented him with the Sum of Five Hundred Pounds, or, which was equivalent, gave each of his five Children One Hundred Pounds.

The same Year also, Bishop *Moore*, his Patron, who had long formed a Design of fixing him in a more conspicuous Station in this Metropolis, procured for him the Rectory of St. *Bennet's*, *Paul's Wharf* in *London*, and soon after carried him to Court, and introduced him to the Queen with the highest Recommendations to her Favour: She immediately appointed him one of the Chaplains in ordinary, and very soon after, in Consideration of his Merit, presented him to the Rectory of St. *James's*, *Westminster*, when it became vacant, in 1709. — From this Time he left off preaching without Notes, and made it his Business to compose and write down as accurate Sermons as he could, “ Not, says Bishop *Hoadly*, because he could not proceed in the former Method with a Copiousness of good Sense and clear Expression, which the noblest Audience might with Pleasure have attended to, but chiefly because, from that Time, it became his Resolution to prepare his Sermons in such a Manner, that they might hereafter be as useful from the Press, as he wished them to be from the Pulpit.” — Upon his Advancement to this Station, he took the Degree of Doctor in Divinity, when the Public Exercise performed on that Occasion at *Cambridge* was prodigiously admired: The Orations were delivered in *Latin*. In the First, he maintained, *That no Article of the Christian Faith, delivered in the Holy Scriptures, is disagreeable to right Reason*. The second was, *That without the Liberty of Human Actions there can be no Religion*. The Doctor's Thesis was upon the first of these Questions, which being thoroughly sifted by that learned and accurate Professor, *James*, the Doctor made an extempore Reply for near Half an Hour, with so little Hesitation and so much to the Purpose, that astonished the Auditors.

This same Year, 1709, Dr. *Clarke* revised and corrected Mr. *Whiston's* Translation of the *Apostolical Constitutions* into *English*. Mr. *Whiston*, tells us, that his own Studies having been chiefly upon other Things, and having rendered him incapable of be-

ing also a Critic in Words and Languages, he desired his great Friend and great Critic, Dr. *Clarke*, to revise that Translation, which he was so kind as to agree to. — In the Year 1712, Dr. *Clarke* published a most beautiful and pompous Edition of *Cæsar's Commentaries*. — The same Year, Dr. *Clarke* published his celebrated Book called, *the Scripture Doctrine of the Trinity*. Mr. *Whiston* informs us, that some Time before the Publication of this Book there was a Message sent to Dr. *Clarke*, from the Lord *Godolphin* and others of Queen *Ann's* Ministers, importing, “ That the Affairs of the Public were with Difficulty then kept in the Hands of those that were for Liberty; that it was therefore an unseasonable Time for the Publication of a Book that would make a great Noise and Disturbance; and therefore they desired him to forbear till a fitter Opportunity should offer itself.” Which Message, says Mr. *Whiston*, the Doctor had no Regard to, but went on, according to the Dictates of his own Conscience, with the Publication of his Book. Notwithstanding, this occasioned a Variety of Books and Pamphlets to be wrote, for a Year and more, *pro* and *con*, our Author speedily answering whatever was published against him: But about the Year 1714, this Book of the Doctor's rendered him obnoxious to the Power Ecclesiastical; and the Lower House of Convocation complained of it in a Letter drawn up and sent to the Upper House, to the following Purport, *viz.* “ That a Book had been lately published and dispersed throughout the Kingdom entitled, *the Scripture Doctrine of the Trinity*, and several Defences thereof by the same Author, which Book and Defences did, in their Opinion, contain Assertions contrary to the Catholic Faith, as received and declared by the reformed Church of *England*, concerning three Persons of one Substance, Power and Eternity, in the Unity of the Godhead, and tending moreover to perplex the Minds of Men in the solemn Acts of Worship, as directed by our established Liturgy, &c.” On the 4th of *June* the Bishops returned for Answer, that they approved their Zeal, — thought there was just Cause of Complaint, and directed an Extract to be made of the most exceptionable Passages therein: After this, however, there appeared in them a Disposition to prevent Dissentions and Divisions, and the Paper he laid before the House in his own Defence was so far satisfactory,

tisfactory; that the Upper House resolved to proceed no farther : But the Lower House, not so satisfied, resolved that the Paper signed and delivered by Dr. *Clarke* did not contain in it any Recantation of the heretical Opinions and Assertions complained of in their Representation, and afterwards produced in their Extract. Thus ended this Affair, the most authentic Account of which we have in a Piece entitled, *An Apology for Dr. Clarke*. And Bishop *Hoadly* assures us, “ That from the Time of his publishing this Book, to the Day of his Death, he found no Reason, as far as he was able to judge, to alter the Notions which he there professed concerning the Father, Son, and Holy Ghost, towards any of those Schemes which seemed to him to derogate from the Honour of the Father on one Side, or from that of the Son and Spirit on the other.”

About the Year 1712, Dr. *Clarke* held a Dispute with Dr. *Smalridge* on this Subject, which was proposed by the Latter; but the Company in general were fully satisfied, that the Evidence on Dr. *Clarke*'s Side was greatly superior to the other.

In the Years 1715 and 1716, Dr. *Clarke* had a Dispute with the celebrated Mr. *Leibnitz*, relating to the Principles of natural Philosophy and Religion; as also on the important Subjects of Liberty and Necessity: This Controversy was published in *French* and *English*; and Bishop *Hoadly* tells us, that the Doctor inscribed it to her late Majesty. Queen *Caroline* made herself acquainted with all the Arguments advanced *pro* and *con*. This Liberty, or moral Agency, says the Bishop, was a darling Point to him; he excelled always, and shewed a Superiority to all whenever it came into private Discourse, or public Debate; but he never more excelled than when he was pressed with the Strength this learned Adversary was Master of, which made him exert all his Talents to set it once again in a clear Light, to guard it against Metaphysical Obscurities, and give the finishing Stroke to a Subject which must ever be the Foundation of Morality in Man, and is the sole Ground of the Accountableness of Intelligent Creatures for all their Actions. This Dispute, as it now stands, will for ever remain an illustrious Monument of a Genius capable of throwing the most pleasing Light where Confusion and Darkeness were wont to reign.

About the Year 1718, Dr. *Clarke* made an Alteration in the Forms of Doxology in the Singing Psalms, which produced no small Noise and Disturbance, and occasioned some Pamphlets to be wrote. The Alteration was this,

To God, thro' Christ, his only Son, immortal Glory be, &c.

And,

*To God, thro' Christ, his Son, our Lord,
All Glory be therefore.*

These were intended for the Use of his own Parish Church; but, upon their being printed, they were dispersed abroad, where at least they were approved: Which occasioned a Letter from the Bishop of *London* (*Robinson*) to the Incumbents of all Churches and Chapels in his Diocese, against their using those new Forms of Doxology, exhorting them, after a Representation of the Case, to use their Endeavours with their several Flocks to have a great Abhorrence of the above mentioned new Forms, and particularly that they did not suffer the same to be used either in their own Churches or in any Schools.

This Letter of the Bishop's gave rise to several Pamphlets, some in Defence of the Bishop of *London*; others, an Apology for the Alteration made by Dr. *Clarke*; some in a serious, others in an ironical Stile, by Persons of different Denominations. The Remark which Mr. *Whiston* makes on Dr. *Clarke's* Conduct herein is, "that he esteemed it one of the most Christian Attempts towards a Reformation upon the primitive Foot: But adds, that the Bishop of *London*, in the Way of modern Authority, was quite too hard for him."

About this Time he was presented, by the Lord *Lechmere*, to the Mastership of *Wigstan's* Hospital in *Leicestershire*. — In 1724, he published XVII Sermons, preached at St. *James's* upon the erecting a Charity-school for the Education of Women Servants. — In the Year 1727, upon the Death of Sir *Isaac Newton*, he was offered, by the Court, the Place of Master of the Mint, worth about 1200*l.* a Year; but this he conceived incompatible with the Discharge of his Duty in the Ministry, and by the Advice of his Friends, particularly Mr. *Emlyn*,
he

The Life of SAMUEL CLARKE. 469

he absolutely refused it; which was looked upon as one of the most laudable Actions of his Life, and to afford an undeniable Conviction that he was in earnest in his Religion.

In the Year 1728 was published, a Letter from *Dr. Clarke* to *Mr. Benj. Hoadly*, F. R. S. occasioned by the Controversy relating to the Proportion of Velocity and Force in Bodies in Motion, and printed in the *Philosophical Transactions*, N^o. 401.

In the Beginning of the Year 1729, he published the 12 first Books of *Homer's Iliad*. This Bishop *Hoadly* calls an accurate Performance; and his Notes, a Treasury of grammatical and critical Knowledge.

The same Year was published, his Exposition of the Church Catechism, and ten Volumes of Sermons in Octavo, Books so well known and so generally approved, that they need no Recommendation.

But the same Year, on *Sunday* the 11th of *May*, going to preach before the Judges at *Serjeants Inn*, he was seized with a Pain in his Side, which made it impossible for him to perform his Office, and he was carried home and continued under his Disorder till the 17th of *May*, and then died, in the fifty-fourth Year of his Age, after enjoying a long vigorous State of Health, having scarce ever known Sickness. Many have attempted to do Justice to his Character, which was truly great and amiable. We shall content ourselves with a short Extract from the Elogium of Bishop *Hare*, and Bishop *Hoadly*.

Bishop *Hare* says of him, " He was a Man who had all the good Qualities that could meet together to recommend him. He was possessed of all the Parts of Learning that are valuable in a Clergyman in a Degree that few possess any single one. He has joined to a good Skill in the three learned Languages, a great Compass of the best Philosophy and Mathematics, as appears by his *Latin Works*; and his *English* ones are such a Proof of his own Piety, and of his Knowledge in Divinity, and have done so much Service to Religion, as would make any other Man, that was not under a Suspicion of Heresy, secure of the Friendship of all good Churchmen, especially the Clergy. And to all this Piety and Learning was joined, a Temper happy beyond Expression; a sweet, easy, modest, obliging Behaviour, adorned all his Actions; and neither Passion, Vanity, Insolence,

lence, or Ostentation appeared either in what he said or wrote. This is the Learning, this the Temper of the Man, whose Study of the Scriptures has betrayed him into a Suspicion of some heretical Opinions.”

Bishop *Hoadly*, having observed how great the Doctor was in all Branches of Learning, he adds, If in any one of these he had excelled only so much as he did in all, he would have been justly intitled to the Character of a great Man: But there is something so very extraordinary, that the same Person should excel not only in those Parts of Knowledge which require the strongest Judgment, but in those which require the greatest Memory too. So that, in a very high Degree, Divinity and Mathematics, experimental Philosophy and classical Learning, Metaphysics and critical Skill, were united in Dr. *Clarke*.

And from hence we find her late Majesty Queen *Caroline* took great Pleasure in his Conversation and Friendship, seldom missing a Week in which she did not receive some Proof of the Greatness of his Genius, and of the Force of superior Understanding. Much more is said in his Commendation by Bishop *Hoadly*, Dr. *Sykes*, and Mr. *Whiston*, in their Memoirs of his Life: To which we refer the Curious.

Dr. *Clarke* married *Catherine*, the only Daughter of the Rev. Mr. *Lockwood*, Rector of *Little Missingham* in the County of *Norfolk*, by whom he had seven Children, four of whom survived him: And it is observable, that from her good Sense and unblamable Behaviour, he was happy to his Death.

The LIFE of WILLIAM WHISTON.

WILLIAM WHISTON, an eminent Divine and Philosopher, of uncommon Parts, more uncommon Learning, but of singular and extraordinary Character, was born the 9th of *December*, 1667, at *Norton* in the County of *Leicester*, of which Place his Father, *Josiah Whiston*, a learned and pious Man, was Rector. He was educated under his Father 'till he was seventeen Years of Age; in 1684 he was sent to *Tamworth* School,

School, and two Years after admitted of *Clare Hall* in *Cambridge*, where he pursued his Studies, and particularly the Mathematics, eight Hours in a Day, till the Year 1693: During this Time, and while he was under Graduate, he had a Weakness and Dizziness of Sight, contracted by too much Study, which was in a good Measure relieved by hanging the Place opposite to his Seat with Green.

In 1693, he was made Master of Arts and Fellow of the College, and soon after commenced one of the Tutors; and Archbishop *Tillotson* sent him one of his Nephews for a Pupil; but his ill State of Health not permitting him to continue a Tutor, he resigned his Pupils to Mr. *Langhton*. As he had then taken Orders, he became Chaplain to Dr. *More* then Bishop of *Norwich*, and during the Time of his Chaplainship, which was four Years, he published his first Work, entitled *A new Theory of the Earth*, from its Original to the Consummation of all Things. This Work, in MSS, was submitted to the Inspection of Dr. *Bentley*, Sir *Christopher Wren*, and Sir *Isaac Newton*, on whose Principles it depended: And though Mr. *John Keill*, after its Publication, censured some Things in it as inconsistent with some Principles of the Mathematics and Philosophy, yet it brought no small Reputation to our Author.

In the Year 1698, Bishop *More* gave him the Living of *Lowestoff* in *Suffolk*, where he immediately went to reside, and devoted himself to the Discharge of that Trust; and, though he kept a Curate, generally preached twice every Sunday, and all the Summer read a Catechetic Lecture in the Evening, for the better Instruction of the Adult, and continued it for some Years with Diligence and Success.

In the Beginning of this Century he was called to be Sir *Isaac Newton*'s Deputy, and afterwards made his Successor, in the *Lucasian* Professorship of Mathematics, when he resigned his Living and went to *Cambridge*.

In 1702, he published *A short View of the Chronology of the Old Testament*, and of the Harmony of the four Evangelists: And, in 1707, *Prælectiones Astronomicæ*; and eight Sermons on the Accomplishment of Scripture Prophecies, preached at *Boyle's* Lecture. — And, in 1708, *Tacquet's Euclid*, with select Theorems of *Archimedes*, the former of which had been his first Introduction

to the Study of the Mathematics : — In the same Year, he drew up an Essay upon the Apostolical Constitutions, which the Vice-chancellor refused his Licence for printing. The Author tells us, he had read over the two first Centuries of the Church, and found that the *Eusebian*, or *Arian* Doctrine was for the Main the Doctrine of those Ages, which, though deemed Heterodox, he thought it his Duty to discover. — In 1709, he published a Volume of Sermons and Essays on various Subjects. — In 1710, he published *Prælectiones Physico-Mathematicæ*, which, with the *Prælectiones Astronomicæ*, were translated and published in *English*. And it may be said, with no small Honour to the Memory of Mr. *Whiston*, that he was one of the first who explained the *Newtonian* Philosophy in a popular Way. — But among other Things, he translated the *Apostolical Constitutions* into *English*, which favoured the Doctrine of the Supremacy of the Father and Subordination of the Son, vulgarly called the *Arian Heresy*: And hereupon his Friends began to be alarmed for him; and the Consequence shewed it was not groundless; for, Oct. 30, 1710, he was deprived of his Professorship, and banished the University of *Cambridge*, after he had been formally convened and interrogated for some Days together.

At the Conclusion of this Year, he wrote his historical Preface afterwards prefixed to his *Primitive Christianity revived*, containing the Reasons of his Dissent from the commonly received Notions of the Trinity.

After his Expulsion from *Cambridge*, he went to *London*, where he conferred with Dr. *Clarke*, Dr. *Benj. Hoadly*, and other learned Men, who endeavoured to moderate his Zeal, which, however, he would not suffer to be tainted or corrupted, and many were not much dissatisfied with the Authority of these Constitutions, and approved his Integrity.

Mr. *Whiston* now settled at *London* with his Family, and though it does not appear that he had any certain Means of Support, he wrote Books and maintained the same Vigor and Chearfulness of Mind. — In 1721, he published an Essay towards restoring the true Text of the *Old Testament*: — In 1724, The literal Accomplishment of Scripture Prophecies: — In 1727, The miraculous Deliverance of *Marius Antoninus* and his Army, on the Prayers of the Christians: —

The Life of WILLIAM WHISTON. 473

In 1730, *Memoirs of the Life of Dr. Samuel Clarke*: ——— In 1732, *An Account of the Darkeness at our Saviour's Passion*: ——— 1736, *Athanasian Forgeries, &c.* ——— *The Primitive Eucharist revived*: ——— In 1737, *The Astronomical Year, particularly of the Comet foretold by Sir Isaac Newton*: ——— 1740, *The Genuine Works of Flavius Josephus*: ——— A friendly Address to the *English Baptist*: ——— In 1745, *His primitive New Testament in English*: ——— In 1748, his *Sacred History of the Old and New Testament*; and *Memoirs of his own Life and Writings*, which are very curious and not without their Use. ——— He continued many Years a Member of the established Church; but at last forsook it, and went over to the Baptists, which happened while he was at the House of *Samuel Barker, Esq;* at *Lynden* in *Rutlandshire*, who had married his Daughter. ——— He died, after a short Illness, the 22d of *August*, 1752, aged 84 Years and 8 Months. The Character of this conscientious and worthy Man has been attempted by two very able Personages, *viz.* *Bishop Hare* and *Mr. Collins*: They both afford us something curious and entertaining, we shall therefore borrow an Extract from each.

Bishop Hare characterizes him “A Man of a fair unblemished Character; one who has all his Life been cultivating Piety and Virtue, and good Learning; rigidly constant himself in the public and private Duties of Religion, and always promoting in others such Virtue and good Learning as he thought most for the Honour of God, by manifesting the Greatness and Wisdom of his Works. He has given the World sufficient Proofs that he has not mispent his Time, by very useful Works of Philosophy and Mathematics: He has applied one to Explication of the other, and endeavoured by both to display the Glory of the great Creator. And, to his Study of Nature, he early joined the Study of the Scriptures, and his Attempt, whatever the Event be, was at least well meant: And if he has not succeeded, no more have others who have meddled with the same Subjects; nor is he more to be blamed than they: More to be blamed, did I say, I should have said, not less to be commended; for sure it is a commendable Design to attempt to explain Scripture Difficulties, and to shew that there is nothing in the sacred Writings but what is true and rational. But what does a

Life, thus spent, avail? To what Purpose so many watchful Nights and weary Days, so much Piety and Devotion, so much Mortification and Self-denial, such a Zeal to do good and to be useful to the World, so many noble Specimens of a great Genius and of a fine Imagination? 'Tis the poor Man's Misfortune; for poor he is, and like to be, not having the least Preferment to reward his Merit. ——— Whereas, if he had been orthodox it is more than probable he would have been cried up as an Ornament of the Age, and no Preferment denied him.

Mr. *Collins*, who published a Discourse of the Grounds and Reason of the Christian Religion, says, Mr. *Whiston* was a Person of extraordinary natural Parts, and of great acquired Learning, particularly in Philosophy and Mathematics; but above all in Theology, which he has studied with the greatest Application and Integrity in the Scriptures, and in the Writings of the Ancients, despising the Catechisms, Confessions, or Articles of Faith and Tradition of all modern Churches, and the Commentaries on Scripture and systematical Books of all modern Theologues. He knows how to make the best of every Argument he takes in Hand, by his Sagacity and Quickness, by the Compass of his Reading, and, by his great Memory, he omits nothing that can be urged to support his Sentiments. He is an upright and a religious Man; and a most zealous Christian, leading a moral Life, as is common to most who are stiled Heretics; renouncing Glory, Riches, and Ease, and courageously undergoing Abloquy, Poverty, and Persecution; all three whereof have been his Lot, deeming the Concealment of his religious Sentiments, or professing to believe what he did not, a great Crime. ——— He lives for the most Part in *London*, where he visits Persons of both Sexes and of the highest Rank, who are delighted with his Plainness, Integrity, Sense, and Learning; to whom he discourses with the greatest Freedom on many important Points, and inculcating this Belief, that the Father, the Son, and the Holy Ghost are three distinct intelligent Agents; That the Father was before, and is greater than the Son, according to the Scriptures. ——— His Aim is also to restore primitive Christianity: Nor is he without great Designs for the Improvement of Philosophy, and for the Welfare and Trade of his Country, as appears by his Attempts to explain

explain the Philosophy of Sir *Isaac Newton*, and by his Attempts to discover the Longitude. But the greatest good he possibly can aim at, is, putting Men upon Enquiry, and rejecting all narrow and partial Principles; to found their Belief and Profession upon the Knowledge of what is Truth. In fine, he was naturally of a chearful Disposition, which he cultivated to the last, and recommended to others as most consistent with their Duty and their Happiness.

The LIFE of IGNATIUS GASTON PARDIES.

IGNATIUS GASTON PARDIES, a very learned *French* Philosopher and Mathematician, was born at *Paris* in 1636. He descended from an eminent Family, his Father was a Counsellor in the Parliament of *Paris*, who gave his Son an early and liberal Education; so that at the Age of Sixteen he entered into the Order of *Jesuits*, and made so great a Proficiency in his Studies, that he taught polite Literature, and composed many Pieces in Prose and Verse with a distinguished Delicacy of Thought and Stile, before he had scarce arrived to Manhood. Propriety and Elegance of Language appears to have been his first Pursuits; for which Purpose he studied the *Belles Lettres*, and other learned Productions: But at Length he devoted himself to the mathematical and philosophical Studies, and read, with due Attention, the most valuable Authors, ancient and modern, in those Sciences; so that he made himself Master of the *Peripatetic*, as well as *Cartesian* Philosophy in a short Time, and taught both with great Reputation; not confining himself absolutely to the *Cartesian* Principles, he aimed at improving these Sciences, in which he discovered a remarkable Genius, and acquired great Reputation in his Profession, in the several Places where he taught, and particularly at *Paris*, from his Pupils in general; and the Glory he acquired raised the highest Expectations of his future Usefulness, which was cut short by his Death, when he was but thirty-seven Years of Age. His

476 BIOGRAPHIA PHILOSOPHICA.

Works indicate his extensive Genius, and close Application to Study which were principally as follows:

- I. Elements of Geometry.
- II. A Discourse of Local Motion.
- III. A Treatise of Statics, or the Science of moving Forces.
- IV. A Description of two Machines for making Dials.
- V. A Discourse on the Understanding of Brutes.
- VI. A Dissertation on the Nature and Motion of Comets.
- VII. Of a two-fold wonderful Clock.

Besides these there are several Letters published in the *Philosophical Transactions* in the Year 1672, relative to a Dispute this Author had with Sir *Isaac Newton* on his *New Theory of Light and Colours*.

The LIFE of WILLIAM AMONTONS.

WILLIAM AMONTONS was born in *Normandy*, August 31, 1663: His Father having removed to *Paris*, *William* received the first Rudiments of his Education in that City, and had made considerable Progress in the *Latin* School: He had a considerable Illness, wherein he contracted such a Deafness as obliged him to renounce almost all Conversation with Mankind. In this Situation he began to think of employing himself in the Invention of mechanical Instruments: He applied therefore to the Study of Geometry; he likewise studied the Arts of drawing Plans, Architecture, and surveying of Lands: In Process of Time, he bent his Mind to the Study of those sublime Laws upon which the Regulation of the heavenly Bodies principally depend. He studied, with particular Attention, the Nature of Barometers and Thermometers, which he brought to great Perfection: And we may add, that this Invention is still in very considerable Use among the Learned in most Parts of *Europe*, and next in Universality to *Fahrenheit's*, and is that in particular which the celebrated Professor *Daun* at *Petersburgh* made Use of

The Life of WILL. AMONTONS. 477

in his very extraordinary Experiments relative to the Congelation, or freezing, or, rather, fixing of Quicksilver.

In 1687, he presented a new Hygroscope to the *Royal Academy of Sciences*, which was highly approved by the Society, and contributed to enhance the Reputation of the Inventor.

He communicated some other Conjectures, relative to the Improvement of this Instrument, to Mr. *Hubin*, a famous Enameller; but Mr. *Hubin* did not immediately accede to the Opinions of Mr. *Amontons*, which, for some Time, discouraged his communicating his Inventions of this Kind.

At length, he resolved upon taking a Voyage to *England*, where he mentioned the same Thoughts to the Fellows of the *Royal Society*, where he found friendly Encouragement to his Genius. — He then proposed a Method of conveying Intelligence, with great Expedition, by the Use of Telescopes; but as this Method was not reduceable to real Use, it did not meet with much Approbation from the Society. Nevertheless, at his Return to *Paris*, he made some Experiments before some of the Royal Family, and other Persons of Distinction, which afforded some Satisfaction to the Spectators.

In 1695, he published Observations and Experiments concerning the Manner of making a new Hour-glass, and concerning Barometers, Thermometers, and Hygroscopes. This is the only Book which he wrote, besides some Pieces which are published in the *Journal des Sçavans*. Though the Hour-glasses, made with Water, so much in Use among the Ancients, were entirely laid aside, because Clocks and Watches are much more useful, yet Mr. *Amontons* took a great deal of Pains in making his new Hour-glass, being in Hopes that it might serve at Sea, it being contrived in such a Manner that the most violent Motion could not alter its Regularity; whereas, a great Agitation infallibly disorders a Clock or Watch.

When the Royal Academy was new regulated in 1699, Mr. *Amontons* was chosen a Member of it, and read, for the first Lecture, his *New Theory of Friction*, in which he very happily cleared up a very useful and important Part of Mechanics. He had not only a remarkable Talent for Invention, but a very good Genius for making Experiments; as his Notions were delicate and just, so he had that Accuracy in the Execution of his Schemes

Schemes as to prevent any Inconvenience in his new Inventions. He was remarkable for the Regularity of his Life, to which we may, in some Measure, attribute the Strength of his Understanding, and his great Freedom, many Years, from the Infirmities incident to human Nature: But, at length, was suddenly seized with an Inflammation in his Bowels, which soon mortified and became the Occasion of his Death, the 11th of *October*, 1705, being then 42 Years of Age.

The LIFE of HERMAN BOERHAAVE.

HERMAN BOERHAAVE, one of the most celebrated Physicians this, or perhaps any Age has produced, was born at *Voorhout* in *Holland*, near the City of *Leyden*, the 31st of *December* 1668: His Father intended him for the Study of Divinity; with this View he himself initiated him in Grammar, according to the Method of *Vossius*, and proceeded with him from the *Colloquies of Erasmus* to *Terence*, the *Greek Testament* and universal History. About the twelfth Year of his Age, he was afflicted with a malignant Ulcer in his Left Thigh, which baffled all the Art of Surgery, and greatly interrupted his Studies for five Years; but, after all other Methods had failed, he himself, by fomenting it with Salt and Wine, effected a Cure, and thereupon conceived his first Thoughts of studying Physic.

In 1682, he was sent to *Leyden* and put under the Care of Mr. *Wynschotan*, Master of the public School, and, at the Expiration of the Year, was advanced to the highest Class, and qualified for the University. But at this Time his Father dying, leaving a Wife and nine Children, (with but a slender Provision,) of whom *Herman*, though but sixteen, was the eldest, it was like to prove a great Hindrance to his Acquisition of Learning. However, the Proficiency he had made had ingratiated him into the Favour of Persons of Note, and, upon his Admission to the University of *Leyden*, Mr. *Trigland*, Professor in Divinity, an Acquaintance of his late Father, procured him the

Patronage

The Life of HERM. BOERHAAVE. 479

Patronage of Mr. *Daniel Van Alphon*, Burgomaster of *Leyden*; by the Advice and Assistance of those Gentlemen he attended the principal Lectures on Logic, the Use of the Globes, natural Philosophy, Metaphysics, and Ethics: He likewise attended *Gronovius's* Lectures on Greek and Latin Authors, *Richius* on Latin Classics, Rhetoric, Chronology, and Geography; and *Trigland* and *Scaafe* on the Hebrew and Chaldee Languages, in order to understand the Scriptures in their Originals.

In 1687, he applied himself to the Mathematics, and found the Study so entertaining and interesting, that, after having gone through Geometry and Trigonometry, he proceeded to Algebra, under *Volder*, to the Year 1689, when he gave a Specimen of his Erudition in an Academic Oration, “proving that the Doctrine of *Epicurus*, concerning the chief Good, was well understood by *Cicero*,” for this he received the golden Medal, which usually is accompanied with a general Applause of such probationary Exercise.

In 1690, he took a Degree in Philosophy: In his Thesis on this Occasion, with great Strength of Argument, he confuted the Systems of *Epicurus*, *Hobbs*, and *Spinoza*.

After having laid a solid Foundation in all other Parts of Learning, he proceeded to the Study of Divinity under the Professors *Trigland*, *Spanheim*, and *Mark*. The first gave Lectures on Hebrew Antiquities; the second, on ecclesiastical History; under whom *Boerhaave* held a public Theological Disputation.

Notwithstanding he was thus qualified for entering into Holy Orders, which, according to his Father's Intention, he had hitherto chiefly in View, and that his Patrimony was by this Time almost wholly exhausted; yet such was his Diffidence, he attempted rather by teaching the Mathematics to defray the Expence attending the farther Prosecution of his Theological Studies: By this Means he not only increased his Reputation, but (what laid the Foundation of his future Fortune) was introduced to an intimate Friendship with *John Vandenburg*, Burgomaster of *Leyden*, by whom he was recommended to the Curators to compare the *Vossian* Manuscripts (purchased in *England* for the public Library at *Leyden*) with the Catalogue of Sale, which he executed with such Accuracy as procured him the Esteem of the University, and recommended him in so particular

lar a Manner to Mr. *Vandenburg*, that this Gentleman became ever after sollicitous for his Advancement: And, observing what amazing Progress Mr. *Boerhaave* had made in what he applied himself to, persuaded him to join the Study of Physic to Philosophy and Theology, as a Relaxation from Divinity: And, in Complaisance to this Gentleman, he entered upon the Study of Physic, for which his Acquaintance with the learned Languages and natural Philosophy had so suitably prepared him. The Study of Medicine commencing with that of Anatomy, he diligently perused *Vesalius*, *Fallopious*, and *Bartholin*, oftentimes himself dissecting, and attending the public Dissections of Professor *Nuck*. He moreover applied himself to the Study of the Fathers in Physic, beginning with *Hippocrates*, and, in their Chronological Order, reading carefully all the *Greek* and *Latin* Physicians. He then proceeded to acquaint himself with the most approved modern Authors, particularly with *Sydenham* whom he usually stiled the *immortal Sydenham*. He next applied to Chemistry, which so captivated him, that he sometimes spent Days and Nights successively in the Study and Processes of this Art. He made also a considerable Progress in Botany; not contenting himself with inspecting the Plants in the Physic Gardens, he sought others, with Fatigue, in Fields, Rivers, &c. thoroughly examining what he found, and comparing them with the Delineation of Authors.

The Progress he hitherto made in Physic was without any Assistance from Lectures, except those mentioned in Anatomy, and a few by Professor *Drelincourt* on the Theory: He therefore went to the University of *Harderwick* in *Guelderland*, and in 1693 was created there Doctor of Physic. — Upon his Return to *Leyden*, he persisted in his Design of engaging in the Ministry, and, after some Opposition made, through a false Representation of his Principles, accepted a License for the Pulpit. But, notwithstanding his Merit, nothing very interesting offered to his Acceptance, and his Circumstances being but narrow, he reassumed the Study and Practice of Physic, reading the most valuable Authors.

In 1701, on the Death of Professor *Drelincourt*, he became Lecturer upon the Institutes of Physic, and delivered an Oration the 18th of *May*, the Subject of which was, to recommend the

the Study of *Hippocrates*, apprehending that either through Indolence or Arrogance this Founder of Physic had been shamefully neglected.

Boerhaave's Pupils could not but observe, in his Lectures on the medical Institutions, how judiciously he interspersed Chemistry, so as to render the Art, by his Application of it, subservient to the Illustration of his Lectures. They were so pleased with their Preceptor and his Doctrine, that they requested, with much Importunity, that he would instruct them in Chemistry as well as in Physic. In this he acquitted himself so well, that two Years afterwards, *viz.* in 1703, he was invited to a vacant Professorship of Medicine, by the University of *Grottingen*, which he declined. This was considered by the University of *Leyden* as an Obligation on them to augment his Salary, and promised him likewise the first medical Professorship that should be vacant. From this Time to *February* 18, 1709, *Boerhaave* officiated as a Professor with the Title of Lecturer only, when, upon the Death of *Dr. Hotton*, the Professorship was conferred upon him. His inaugural Oration was upon the Simplicity of true medical Science, wherein, exploding the Fallacies and Ostentation of Alchemistical and Metaphysical Writers, he reinstates Medicine on the ancient Foundation of Observation, Experiments, and Deductions naturally resulting from them. In a few Years, he enriched the Physic Garden with such a Number of Plants, that it was found necessary to enlarge it to twice the Dimensions.

In the Year 1714, he was advanced to the Dignity of Rectorship in the University, and very soon after, in that same Year, was constituted Professor of the Practice of Physic, in the room of *Bidloo*, and twice a Week attended the University Hospital, not less to the Advantage of his Pupils than Patients. — During his Rectorship, in 1725, he delivered an Oration on the Methods of obtaining Certainty in Physics, in which he very learnedly shewed, that we are entirely ignorant of the first Principles of Things, and that all our Knowledge of their Qualities is derived either from such Experiments as subject them to our Senses, or from Consequences, by an exact Method of Reasoning deduced from those Experiments.

In the Year 1728, Dr. *Boerhaave* was elected a Member of the *Academy of Sciences* at *Paris*, in the room of Count *Marsigi*, deceased; and in *April* 1730, he was proposed, and unanimously elected a Member of the *Royal Society* at *London*.

About *August* 1722, Dr. *Boerhaave* had a severe Fit of Illness, another in 1727, and being, as it were, threatened with a Relapse in 1729, he resigned his Professorship of Botany and Chemistry. This gave Occasion to his excellent Declamation in *August* 28, in which he recounts, next to the Favours of Providence, many Instances of Friendship which had contributed to the Happiness of his Life, and expressing the Satisfaction and Pleasure attending his Endeavours to promote the Knowledge of those useful Sciences which had so much employed his Studies, which he hoped had been attended with some Success.

His eighth, and last Oration he delivered, *Feb.* 8, 1731, on laying down his Rectorship. In this he endeavoured to demonstrate, that a real Attention to Nature, in observing her Dictates and following her Example, is the sole Foundation of Merit in a Physician, and entitles him to the highest Honours in his Profession; and that the Art of healing is never more successful, than when directed by Nature. No Professor was ever attended in public and private Lectures, by so great a Number of Students from such different and distant Parts, for so many Years successively, and few ever acquired such universal Esteem. He was remarkable in his Address to Senior Physicians, and in his Courtesy to the Rest; his Action in delivering his Lectures was both expressive and engaging, and, being without Affectation, it seemed the Gift of Nature, rather than the Acquisition of Art. His Manner of explaining Things was simple, methodical, and exact, as well as suited to the Dignity of his Subject. — In the Administration of Justice, he had no Respect to Persons; nor was ever awed into unworthy Compliances by the Frowns of the Great. He was always modest without Meanness, and steady without Rudeness. He neither swerved from Justice himself, nor connived at it in others. By the Veneration of his Countenance, blended with Sweetness, by Lenity without Softness, and by an Acquaintance with the Civil Law of his Country, he became an Ornament to Magistracy itself. — In his private Character, says the Author of his Life,

Life, he was no less amiable in private Conversation, seldom making his own Works, or Affairs, the Subject of Discourse. In Friendship, he was sincere, constant, and affectionate: He was communicative without Conceitedness; and zealous, though dispassionate, in contending for the Truth; and so unmoved by Detraction as to say, “ The Sparks of Calumny will be presently extinct of themselves, unless you blow them.

The latter Part of his Life was chiefly spent at his Country Seat, where his Garden was stored with all curious exotic and native Plants: These he esteemed his greatest Riches, and the Study of their Nature his greatest Pleasure. His close Attention thereto was thought to hasten his Death: After frequent Intervals of Illness, he died the 23d of *September* 1738, with that Calmness and Serenity of Mind which results from doing Good, and the Hopes of divine Favour, near Seventy Years of Age.

He wrote, and published many useful Tracts in Mechanics, on Chemistry, Plants, Medicine, &c. (a List of which are prefixed to his *Elements of Chemistry*) which were printed from 1701 to 1728.

The LIFE of JOHN FREIND.

JOHN FREIND, a learned Physician, Chemist, and Historian, was born in the Year 1675 at *Croton* in *Northamptonshire*, of which Place his Father was Rector, a Man of Learning, Piety, and Integrity, who, observing the promising Genius of his Son, sent him early to *Westminster* School, and put him under the Care of the celebrated Mr. *Busby*, where he made a considerable Progress in Learning, and was from thence elected to *Christ-Church* College in *Oxford* in the Year 1690, and soon after published a *Greek Oration of Demosthenes*, which was well received. — He read, with great Attention, the *Greek* Poets, Orators, and Historians of Antiquity, in order to render himself a perfect Master of the *Greek* Language, and to acquire a Facility in *Latin* Verse as well as Prose, — He then began to apply him-

self to the Study of Physic, and his first Care was to digest thoroughly the true and rational Principles of natural Philosophy, Chemistry, and Anatomy, to which he added a sufficient Acquaintance with the Mathematics. The first public Specimen he gave of his great Abilities was in the Year 1699, when he wrote a Letter to Sir *Hans Sloane* concerning an Hydrocephalus, or Watry-head; and, in 1701, another Letter to the same Gentleman, in *Latin*, of some extraordinary Cases attending Convulsions, which seized People at that Time in *Oxfordshire*, which, made great Noise in *England* from its malignant Nature: In which our Author shewed great Penetration, and communicated his Sentiments with much Approbation and Usefulness, which are printed in the *Philosophical Transactions*, N^o. 256, September 1699, and N^o. 270 in 1701.

Being now well known and distinguished among the Faculty, he began to meditate larger Works, read the Writings of *Borelli*, *Baglivi*, *Pitcairne*, and *Keille*, and, with some Success, attempted to introduce the most concise and certain Method of investigating medical Truths than had been known beforetime, and he resolved to apply it to the most important Subjects in which the Learned were not agreed: For this Purpose, in 1703, he published his *Emmenologia*: Which has been esteemed an excellent Performance, admirable for the Beauty of its Style, the elegant Disposition of its Parts, the wonderful Succinctness, and, at the same Time, Perspicuity of the Whole.

In the Year 1704, he was chosen Professor of Chemistry in the University of *Oxford*, and the Year after, for farther Improvement, he attended the Earl of *Peterborough* in his Expedition to *Spain*, as a Physician to the Army, where he continued two Years; thence made his Tour of *Italy*, and went to *Rome* to view the Antiquities and consult with the Learned in diverse Professions. — On his Return to *England* in 1707, he found the Character of his illustrious Patron very rudely treated, which induced him, from a Spirit of Gratitude, to undertake his Defence, which underwent several Impressions and did Honour to his Character.

In July, 1707, he was created a Doctor in Physic by *Diploma*; and in 1709, he published his chemical Lectures, in which almost

most all the Operations of Chemistry are reduced to their true Principles and Laws of Nature. These Lectures are dedicated to Sir *Isaac Newton*. They were attacked by some German Philosophers, who were somewhat alarmed at the new Principles: To which Dr. *Freind* published an Answer in the *Philosophical Transactions* in Latin; but both the Pieces have been since published in *English*.

In the Year 1712, he was elected a Member of the *Royal Society*, and the same Year attended the Duke of *Ormond* into *Flanders* as his Physician, and returned to *London* in 1714, where he resided for some Years, applying himself with great Assiduity to the Discharge of his Profession.

In 1716, he was chosen a Member of the College of Physicians, and published several valuable Pieces in that Science, though it occasioned some Disputes amongst the Learned at that Time: The Disputes were conducted with much Decency and apparent Usefulness.

March the 7th, 1717, he read the *Gulstonian* Lecture in the College of Physicians; and on the 18th of *October*, 1720, pronounced the Anniversary Lecture before that learned Body, which was afterwards published and highly applauded.

In 1722, he was elected a Burgess in Parliament for *Launceston* in *Cornwall*, and acted in that Station, as a Senator, with that Freedom and Regard to the Interest of his Country as was both natural and honourable.

About this Time he was supposed to have a Hand in *Atterbury*, the Bishop of *Rochester's* Plot, and was thereupon sent to the Tower, March 15, 1722-3: He continued a Prisoner there 'till the 21st of *June* following, when he was bailed by Dr. *Mead*, Dr. *Hulse*, Dr. *Levet*, and Dr. *Hale*; and in *November* following was discharged from his Recognizance.

The Leisure afforded him by this Confinement was not so disturbed by Uneasy Thoughts as to divert him from those Studies which were agreeable to his Abilities and Profession; but he wrote there another Letter to Dr. *Mead* on the Subject of the Small-Pox — His History of Physic, from the Time of *Galen* to the Beginning of the XVIth Century. This Work was justly esteemed a laborious and masterly Performance.

Soon

Soon after he obtained his Liberty, he was made Physician to the Prince of *Wales*, and, upon that Prince's Accession to the Throne, he became Physician to the Queen, who honoured him with a large Share of her Confidence and Esteem. But he did not enjoy this Favour long, for he died of a Fever the 26th of *July*, 1728, in the 52d Year of his Age.

Their Majesties expressed the utmost Concern at his Death, and, in Consideration of his Merit, settled a Pension upon his Widow, who took Care of the Education of his only Son. He was buried at *Hitcham* in *Buckinghamshire*, where a Monument was erected to his Memory. Several Gentlemen have attempted his Character. Dr. *James Keille* speaks of him as “a Master of Writing and Teaching scarcely to be equally.” Foreign Physicians and Philosophers, as *Hoffman*, *Helvetius*, *Hecquet*, and *Boerhaave* have spoke of him with great Veneration: But Dr. *Edward Wilmot* more fully Characterizes him as a deep Philosopher, a learned Physician, an elegant Writer, an Ornament to Society, and, to the utmost of his Power, the Friend of Mankind.

The LIFE of BERNARD DE FONTENELLE.

BERNARD DE FONTENELLE, a celebrated *French* Author, was born in *France* about the Year 1655: He wrote on Subjects of Tragedy in his younger Years, of polite Literature and Philosophy in maturer Life, but was chiefly famous as a florid Eulogist. Some of his Productions of the first Kind were wrote before he was Twenty Years of Age, viz. *Thetis* and *Peleus*, *Æneas* and *Lavinia*. About the Year 1680, he wrote several other Pieces in the tragic Way, in some of which, it is said, he discovered a Genius and Profoundness of Thought superior to his other Works. In his poetical Performances, and Dialogues of the Dead, the Spirit of *Voiture* was discerned, but more extended and philosophical. His Treatise on the *Plurality of Worlds* is a Work singular in its Kind: His Design therein was to present that Part of Philosophy in a gay and pleasing

pleasing Dress. — He likewise wrote an entertaining Piece, which, though chiefly extracted from *Vandale's* Oracles, in Pursuit of whose Scheme of exploding the Oracles for Human Impostures, he treated of some tender Points in such Manner, which, though he displayed an accurate Genius, raised him some Enemies; and he found, says *Voltaire*, how dangerous it is for a Man, though in the Right, to differ in Opinion from those whose Judgment receives a Sanction from Authority.

He now applied himself to Geometry and Natural Philosophy; nor was he less successful in the Study of these Sciences, than he had been in that of polite Literature. In this Part of his Life, he obtained much esteem and Applause, and was appointed perpetual Secretary to the *Academy of Sciences*, which Trust he discharged for more than Forty Years with general Approbation. — His *History of the Academy of Sciences* often throws a great Light upon their Memoirs, which are generally very obscure; but, at the same Time, it abounded with such beautiful Flowers of Language as rendered them more justly admired.

The Elogies which he spoke on the deceased Members of the Academy have this peculiar Merit, that they excite a Respect for the Sciences as well as for the Author; and, upon the whole, he was looked upon as the great Master of the Art of teaching abstracted Sciences in a Manner that made their Study at once easy and agreeable: Nor are any of his other Works void of Merit. All these natural Parts were assisted by a Knowledge of the Languages and History, and he certainly excelled many Men of Learning who have not had the Gift of Invention. He died in the Year 1756, somewhat more than 100 Years of Age.

The LIFE of Sir HANS SLOANE, Bart.

SIR *Hans Sloane*, an eminent Physician and Naturalist, and Founder of the *British Museum*, was of *Scottish* Extraction: His Father *Alexander Sloane*, being at the Head of that Colony
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of *Scots* which King *James I.* settled in the North of *Ireland*, where our Author was born at *Killileagh*, April 16, 1660, he very early discovered a strong Inclination to the Study of Natural History, which being encouraged by a suitable Education, he applied those Hours which Youth are apt to squander away in trifling Amusements to the Study of Nature, and the Admiration of her Works. At the Age of sixteen he was seized with a Spitting of Blood, which interrupted the regular Course of his Studies for near three years; he had, however, learned enough of Physic to know that Malady could not be suddenly cured, and his Prudence directed him to abstain from Wine and other inflammatory Liquors; and observing a strict Temperance and Abstinence, which he esteemed the best Preservatives that Nature has vouchsafed to Mankind, he was enabled to prolong his Life beyond the ordinary Age of Man. Soon after his Recovery, in a good Degree, from this Attack, his Desire of perfecting himself in the several Branches of Physic (which he had chosen for his Profession) led him to *London*, and upon his Arrival here he entered himself as a Pupil to the great *Stafforth*, an excellent Chemist bred under the illustrious *Stahl*, by whose Instructions he gained a very considerable Knowledge of the Composition and Preparation of the different Medicines of that Kind: At the same Time, he studied Botany at *Chelsea*, and likewise assiduously attended the public Lectures of Anatomy and Physic in *London*, and, in short, neglected nothing that had any Relation to his Profession.——But his more distinguishing Talent and Merit was that of a Naturalist, and it was this Part of his Character that introduced him early into an Acquaintance with two the most eminent Persons of the Age in that Science, viz. *Mr. Boyle*, and *Mr. Ray*, and he was very careful to improve their Friendship, by communicating to them every striking Object of Curiosity and Use that fell under his Observation, often exciting their Wonder and engaging their Esteem, which continued till their Death.——After about four Years close Application to Study in *London*, *Mr. Sloane* resolved upon visiting foreign Countries for his farther Improvement, and with that View he first set out for *France*, accompanied with two other Students; one of them *Sir Tancred Robinson*: this was about the Year 1683: He was elegantly entertained by
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the famous Mr. *Lemery*, a Chemist, in his Way to *Paris*; and on his Return he obliged Mr. *Lemery* with those four different Kinds of Phosporus, of which, 'till then, he had never the Opportunity of seeing. ——— Mr. *Sloane* spent his Time at *Paris*, much in the same Manner as he had done before in *England*; he attended the Hospitals; heard the Lectures of Messrs. *Tournefort*, *Du Verney*, and other eminent Masters; visited the Learned of every Faculty, who received him with particular Marks of Favour. ——— (Mr. *Tournefort* was one of those celebrated *French* Botanists who made a most curious Collection of Plants, and wrote a History of them, and with whom Mr. *Sloane* had such Connections that were very much for his Improvement and his Honour: And Monsr. *Du Verney*, that famous Anatomist at *Paris*, who began very early to Study the natural History of Animals, and, at length, by several Steps, became intimately acquainted with the human Frame, so as not only to be chosen a Member of the *Royal Academy of Sciences*, and published a curious Piece on the Organ of hearing; but was advanced to be a Tutor to the Dauphin, and had many distinguishing Favours both from his Majesty and the *Royal Academy*, to which learned Body he bequeathed his valuable Collection, at his Decease.) ——— From *Paris* our Author went to *Montpelier*, and having received Letters of Recommendation from Mr. *Tournefort*, he found an easy Access to all the learned Men of that Province, particularly to Mr. *Magnol*, whom he always accompanied in his botanical Excursions about the Neighbourhood of that City, where he beheld, with Pleasure and Admiration, the Productions of Nature in that happy Climate; and he learned, under the Instructions of Mr. *Magnol*, to class them in their proper Order. Having found an ample Field for Contemplation entirely suited to his Taste, he took Leave of his two Companions, whom a Curiosity of different Kind led into *Italy*, and he betook himself for one whole Year to make a Collection of Plants in that Province, and then took a Tour through *Languedoc* with the same View, and, passing through *Tholouse* and *Bordeaux*, returned again to *Paris*, where he made a short Stay, and set out for *England* in the latter End of the Year 1684, with an Intent to settle in his Profession: upon his Arrival at *London* he made it his first Business to visit his two illustrious Friends, Mr. *Ray*

VOL. II. 4 U and

and Mr. *Boyle*, in order to communicate to them the Discoveries he had made abroad; but Mr. *Ray* being retired into *Essex* he sent him a valuable Present of foreign Plants and Seeds, which were the more acceptable to him as he had described many of them in his *Historia Plantarum* on the Credit of other Authors. He continued this most agreeable Intercourse with Mr. *Ray* till his Death, as before mentioned, which was in the Year 1706. About this Time our Author became acquainted with the celebrated Dr. *Sydenham*, who soon contracted such a warm Affection for him, that he took him into his House, and recommended him in the most earnest Manner to his Patients.

He had not been long in *London* before he was recommended by Dr. *Lifter*, as a proper Member of the *Royal Society*, and, being approved, was accordingly elected, *January* the 21st following: And that Year, viz. 1685, he communicated several Curiosities to that Society, and continued to deliver many other curious Observations from Time to Time.

In 1687, he was chosen a Fellow of the College of Physicians in *London*. ——— Dr. *Tancred Robinson* returning this Year, they both communicated to the *Royal Society* some Accounts of the Plant called the *Star of the Earth*, confirmed by Quotation from other Writers, and some Experiments of its Efficacy in curing the Bite of a mad Dog.

The same Year, our Author, in the Pursuit of farther Knowledge of this Kind, accepted the Offer of *Christopher Duke of Albemarle*, to go with him as his Physician to *Jamaica*, whereof he was appointed Governor, and accordingly embarked at *Portsmouth*, *September* the 12th, and arrived the 19th of *December*. Here a new Field was opened for fresh Discoveries in natural Productions: The medical World, however, had been deprived of the Use of it had not our Author, by indefatigable Application, converted, as it were, his Minutes into Hours. The Duke of *Albemarle* dying almost as soon as he landed, and the Duchess his Consort, determining to return to *England* as soon as possible, the Doctor could not entertain a Thought of leaving her in Distress. He improved all his Time in making Collections of natural Curiosities, insomuch, that though his whole Stay at *Jamaica* was scarce Fifteen Months, yet he brought together such a prodigious Number of Plants and other natural

Rarities,

Rarities, as greatly surprized his Friends at his Return. Mr. Ray says, “ When I saw that Gentleman’s Stock of dried Plants, collected in *Jamaica* and some of the *Caribbee* Islands, I was astonished at the Number of the capillary Kind, not thinking there had been so many to be found in the *Indies*.”

On his Arrival at *London* he applied himself to the Practice of Physic, and soon became so eminent, that he was chosen Physician to *Christ’s Hospital* on the 17th of *October* 1694, which he held ’till the Year 1730, and then, on Account of his great Age and many Infirmities, he found it necessary to resign. What is singular, and deserves the highest Commendation, is, that though he received the appointed Salary of that Office punctually, because he would not introduce a bad President, yet he constantly applied the Money to the Relief of those who were the greatest Objects of Compassion in that Hospital.

He had been elected Secretary to the *Royal Society* the 30th of *November*, 1693, and entered upon the Business of that Office by reviving the Publication of the *Philosophical Transactions*, which had been omitted for some Time, and of which he continued the Editor ’till the Year 1712, and the Volumes published in this Period are Proofs of his Industry, many of the Pieces contained being written by himself. In the Interim, he published his *Catalogus Plantarum, quæ in Insula Jamaica, sponte proveniunt, &c. seu prodromi Historiæ naturalis, Pars Prima*, which he dedicated to the *Royal Society*, and College of Physicians. The first Volume was published in 1707, but the Second not till 1725; by this very useful, as well as magnificent Work the *Materia Medica* was enriched with a great Number of excellent Drugs, not known before: A more particular Account of which the Reader may see in the Doctor’s Life, *Biographia Britannica*, Vol. VI. Part. I. but will exceed the Limits of this Work.

———— At the same Time, he laid the Plan of a Dispensatory where the Poor might be furnished, at prime Cost, with such Remedies as their several Maladies should require, which he afterwards, with the Assistance of the President, and other Members of the College of Physicians, carried into Execution.

Our Author’s Thirst for natural Knowledge seems to have commenced with his Being, and his Cabinet of Rarities began with his very early Years, which he was continually en-

riching by the Search of some, and the Purchase of every other natural Curiosity brought to him: But even this Collection acquired but slow Additions 'till the Augmentation it received by the Death of *William Courton*, Esq; a Gentleman who had employed all his Time, and the greatest Part of his Fortune, in collecting Rarities, and who bequeathed the whole to Sir *Hans* on Condition of his paying a few Debts and Legacies, which our Author faithfully performed.

In 1708, the Doctor was elected a foreign Member of the *Royal Academy* at *Paris*, an Honour so much the more regarded as we were then at War with *France*, and the Queen's Consent was necessary to the Acceptance of it: And, in Proportion as his Credit rose among the Learned, his Practice increased among Persons of the highest Rank; Queen *Ann* frequently consulting him in her last Illness, and was bled by him.

Soon after the Accession of King *George I.* to the Throne, April, 1716, the King created the Doctor a Baronet, an hereditary Title of Honour, to which no *English* Physician had ever before arrived; and, at the same Time, made him Physician-General to the Army, which he enjoyed 'till his Majesty's Decease, 1727.

Upon the Accession of *George II.* to the Throne, he was appointed Physician in Ordinary to his Majesty, and prescribed for the Royal Family till his Death: He was particularly favoured by Queen *Caroline*, who placed the greatest Confidence in his Judgment. — In the Interim, he had been chosen unanimously one of the Elects of the *College of Physicians*, June 1, 1716, and was elected President of that College Sept. 30, 1719, in which Station he continued 16 Years, and gave the strongest Proofs of his Zeal and Assiduity in the Discharge of that Trust, supporting the Interest and Credit of that Body by many liberal Disbursements.

He discovered the same Spirit of Generosity to other learned Societies: He no sooner purchased the Manor of *Chelsea*, than he gave the Company of Apothecaries the entire Freehold of their botanical Garden, in 1721, on Condition only, that they should present to the *Royal Society* fifty new Plants annually, 'till the Number should amount to 2000. He likewise gave several Donations for the Improvement of this Garden, the Situation of which,

which, on the Banks of the *Thames*, and near the Capital, was such as rendered it peculiarly useful in two Respects, viz. 1. by producing the most rare medicinal Plants, and 2, by serving as an excellent School to young Botanists, an Advantage which he himself had drawn from it in the early Part of Life.

The Death of *Sir Isaac Newton*, in 1727, made Way for the Advancement of *Sir Hans* to the Presidency of the *Royal Society*. He had long been Vice-President, and frequently sat in the Chair for that great Man; and, by his long Continuance with that learned Body, had contracted a great Friendship for it; so that he, on some Occasion, subscribed 100 Guineas, and likewise caused a curious Bust of King *Charles II.* to be set up in the Great Hall where they meet. He was also an Instrument in procuring *Sir Godfrey Copley's* Benefaction of a Medal of Five Guineas, as an honorary Present to him that should annually communicate the best Experiments to that Society.

Being now placed at the Head of it, he laid aside the Thoughts of all further Promotions, and applied himself wholly to the Study and Discharge of his respective Offices, which were not a few, nor of small Importance, to answer like an able Physician the high Opinion conceived of him; ——— to improve his own Knowledge in natural Philosophy and communicate it to others; ——— to enlarge his Collection of valuable Curiosities, by Correspondence at home and abroad: ——— With these and other laudible Pursuits he employed his Time, his Talents, and his Fortune, from the Year 1727 to 1740, when at the Age of Eighty, he chose a more retired Life; resigned the Presidency, though against the Inclination of the *Royal Society*, who afterwards chose *Martin Folkes*, Esq; to succeed him, and, in a public Assembly, thanked him for the great and eminent Service he had done them, and desired Permission to retain his Name as a Member of their Council so long as he should live.

In the Month of *January*, 1741, he began to remove his Library and Cabinet of Rarities, from his House at *Bloomsbury* to that at *Chelsea*, and retired thither the 12th of *May* to enjoy the Tranquility of a well spent Life. He did not, however, pass his Life in that Solitude which excludes Men from Society and Usefulness: He received the Visits of Persons of Distinction, learned

learned Foreigners and Natives: The Royal Family sometimes did him the Honour. But what was more to his Praise, he never refused Admittance, or giving Advice to the Poor: And that he might be more extensively useful, he published many valuable Receipts for Distempers in the Eyes, for the Bite of a mad Dog, &c. and directed to a proper Regimen under these and other Disorders.

Hitherto the great Temperance and Self-Government of Sir *Hans* had preserved him from feeling many of the Infirmities of old Age; but in his ninetieth Year he began to complain of Pains, and grew sensible of an universal Decay; but was often heard to say, that the Approach of Death brought no Terrors with it, that he had long expected the Stroke, and was ready to receive it whenever the great Author of his Being should think fit. The long expected Moment arrived, after only three Days Illness, *January 11, 1752*. He was interred on the 18th at *Chelfea*, in the same Vault with his Lady: The Solemnity was attended by a great Concourse of People of all Ranks. His Funeral Sermon was preached by *Zachary Pearce*, then Bishop of *Bangor*, who forebore to enlarge on the exalted Qualities of the Deceased, by Reason of an express Prohibition received from the Mouth of the Deceased a little before his Death. Such was his Humility, that he thought it a Degree of Profanation to debase, with the Praises of human Excellencies, the Pulpit, which should be devoted to display to Men the Greatness of the Supreme Being, and to instruct them in his Laws. — Sir *Hans Sloane* married, in 1695, *Elizabeth*, Daughter of Alderman *Langley* of *London*, who died in 1724, by whom he had one Son and three Daughters. — The Writer of his Eloge having observed that the Person of Sir *Hans* was tall and well proportioned, likewise adds, that his Manners were easy, free, and engaging; that his Conversation was sprightly, familiar, and obliging; that nothing could equal his Courtesy to Strangers, he being always ready on the least Notice to shew and explain to them his whole Cabinet, particularly to his Brethren of the *Royal Society*, who thought fit to visit him. His Death was a great Loss to many, especially to the Poor, to whom he was a liberal Benefactor. He was a Governor to almost every Hospital in and about *London*, to each of which he gave 100*l.* in his

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Life-time, and considerable more at his Death. He was extremely solicitous lest his Cabinet of Rarities, which he had taken so much Pains to collect, should be again dissipated at his Death, and yet, not willing that so large a Share of his Fortune should be lost to his Family, and at the same Time desirous that his Countrymen should enjoy the Pleasure and Advantage of his Collection; he therefore bequeathed it to the Public, on Condition that 20,000*l.* should be made good by Parliament to his Family, a Sum which, though large in Appearance, was scarce more than the intrinsic Value of the Gold and Silver Medals, the Ores and precious Stones found in it: There were, besides his Library consisting of more than 50,000 Volumes, 347 of which were illustrated with Cuts finely engraved and coloured from Nature, 3566 Manuscripts, and a great Number of rare and curious Books. — The Parliament accepted the Legacy, and fulfilled the Conditions: The Act for this Purpose, which passed in 1753, is entitled, “ *An Act for the Purchase of the Musæum, or Collection of Sir Hans Sloane, Bart. and of the Harleian Collection of MSS, and for procuring one general Repository for the better Reception, and more convenient Use of the said Collection, and of the Cottonian Library, and Additions thereto.*” In pursuance of this Act, the Sum of 300,000 was raised by Lottery, which abundantly enabled the Parliament to compleat their whole Design; according to which, besides the required Sum of 20,000*l.* paid for Sir Hans’s Collection, the *Harleian* MSS. were purchased at the Rate of 10,000*l.* that magnificent Edifice called *Montague House* in *Russel-street, Bloomsbury*, was also purchased at the Rate of 10,000*l.* To this House, not only the two last mentioned Collections, but the *Cotton* Library with all the Additions thereto, including that of *Arthur Edwards* of *Hanover-square*, bequeathed by his Will in 1738, were removed. By the said Act, fundry great Officers of State, and Bishops for the Time being, are appointed Trustees, and incorporated by the Name of *Trustees for the British Musæum*; and any deputed Number of these, not less than three, have a Power to chuse Officers, or make any other necessary Regulations, 30,000*l.* being placed out to Interest in the public Funds towards the Payment of Salaries, &c. The whole Collection being placed in proper Order, the *Musæum* was opened for public Use in

1759, when several Statutes and Rules relating to the Inspection and Use of it were published by Order of the Trustees: The Substance of which is as follows:

The *Musæum* will be kept open every Day except *Saturday*, *Sunday*, *Christmas day*, and one Week after; one Week after *Easter-day* and *Whit-Sunday*; *Good-Friday*, and every *public Fast* and *Thanksgiving-day*, from IX in the Morning to III in the Afternoon; but on *Mondays* and *Fridays* in *May*, *June*, *July* and *August*, from IV to VIII in the Afternoon.

Persons desirous to see the *Musæum* must, in Writing, give in their Names, Condition, and Places of Abode, who will have Tickets delivered them appointing the Day and Hour when they will be admitted, which are at IX, X, XI, or XII in the Morning; and at IV or V in the Afternoon, on those Days in which the *Musæum* is opened: At that Time they are to be attended by proper Officers in the respective Apartments, who will give the Spectators proper Information relative to the Part of the Collection under his Care.

That the Spectators may view the whole *Musæum* in a regular Order, they will first be admitted to see the Manuscripts and Medals, then the natural and artificial Productions, and afterwards the printed Books, one Hour allowed to the several Companies, so that the whole may be viewed in three Hours.

If any Person come after the Hour marked in his Ticket, but before the three Hours are expired, he may, if he desires it, be permitted to join the Company appointed for the same Hour on his removing into another Department.

Any Person may apply for a Ticket in the Manner above-mentioned, as often as he pleases, provided that no one Person have Tickets at the same Time for more Days than one.

No Children will be admitted.

No Officer, or Servant, must take any Fee, Reward, or Gratuity.

With Regard to Persons who desire to make Use of the *Musæum* for Study: No one will be admitted but by Leave of the Trustees, or of the Committee, and that for six Months only, without a fresh Application: The Names of such Persons, with the Dates of the Orders and their Duration, will be entered in a Book.

A large convenient Room is allotted, in which they may sit and read or write without Interruption, during the Time the *Musæum* is kept open : A proper Officer attends in the Room. They must give Notice in Writing the Day before, what Book or Manuscript they desire to peruse the Day following, which will be provided in readiness to deliver to them, except a few which the Trustees do not permit to be carried out of the Room where they are deposited, without special Leave.

Such Persons will be allowed to take one or more Extracts from any printed Book or MSS. the Transcriber must not lay the Paper on which he writes upon any Part of the Book or MSS he is using.

Every Person intrusted with the Use of any Book is to deliver it to the proper Officer before he leaves the Room, who returns it to the Library, if done with, or places it in a Book-Case in the same Room for his farther Use.

Any Person engaged in a Work, who shall have Occasion to make any drawing of any of the natural or artificial Productions, or to examine it more carefully than can be done in the common Way of viewing the *Musæum*, must apply to the Committee, who meet every other *Friday* at the *Musæum*.

No Part of the Collections belonging to the *Musæum* must at any Time be carried out of the general Repository, except Books, Charters, Deeds, or MSS, to be made use of in Evidence : And these, when requested, must be carried and brought back by one of the under Librarians, or Assistants, on proper Satisfaction made him.

And if any person shall behave in an improper Manner, and contrary to the Rules prescribed by the Trustees, he is liable to be dismissed from the *Musæum*, and not re-admitted.

It is easy to perceive the Advantage that will result to the public from this immense Collection. To have Access to such a Cabinet as this, is, in effect, to Men of Taste, like making the Tour of the World, and having for their Tutor a Catalogue of 38 Volumes in Folio, and 8 in Quarto, containing a short Description of each Curiosity, with a Reference to the Authors who treat of it more largely.

N. B. His present Majesty likewise, soon after his Accession to the Throne, presented a large and valuable Collection of Books and MSS to the *Musæum*, consisting of more than 10,000 Volumes, chiefly relative to the Reign of King *Charles I.* the *Interregnum*, and the Reign of King *Charles II.*

The LIFE of M. VARIGNON.

PETER VARIGNON, born at *Caen*, in *France*, in 1654, was an Architect's Son, in middling Circumstances. He had two Brothers, who followed their Father's Business, but himself was designed for the Church.

In the Course of his Studies, usual at College, various Accidents concurred to favour his natural Inclination to a Study which he assiduously improved.

As Architects, and, sometimes, the common Masons, know how to make Dials, Mr. *Varignon* soon obtained such a Knowledge of that Art as to gain a tolerable Livelihood. He learned the coarse Part of the Work, which was all his Masters could teach him, but was apprehensive that the whole depended upon some general Theory; but this only excited a fruitless Uneasiness.

One Day as he was attending a Course of Philosophy among the Jesuits at *Caen*, looking over some Books for his Amusement, at a Bookseller's Shop, he met with an *Euclid*. He read a few Pages, at the Beginning, and was not only delighted with the Order and Chain of Ideas, but with the Ease with which he comprehended them. How can the Human Understanding but love that which bears Witness to its Powers? He brought the Book away with him, and was always pleased with it, for the same Reasons that at first engaged his Attention to it.

That eternal Uncertainty, sophistical Embarrassment, unprofitable Obscurity, and, frequently, Conceitedness, in School-Philosophy, greatly contributed to make him relish the Clearness, Connection, and Certainty of geometrical Truths.

The Study of Geometry led him to the Works of *Descartes*,
and

and there he was struck with that new Light which has, from thence, spread itself through all the thinking World. *

He abridged himself of the Necessaries of Life to purchase Books of this Kind, or rather considered them of that Number, as indeed they ought to be. What contributed to heighten this Passion in him was, that he studied in private; for his Relations, observing that the Books he studied were not such as were commonly used by others, strongly opposed his Application to them. As there was a necessity for his being an Ecclesiastic he continued his theological Studies, yet not entirely sacrificing his favourite Study to them.

He frequently disputed in the philosophical Classes, and appeared an able Disputant; his Understanding and Constitution being both happily adapted for that Purpose; for on the one Hand his Reasonings were clear and strong, and on the other, his Chest was well formed; and he had an excellent Voice.

At this Time the *Abbe St. Pierre*, who studied Philosophy in the same College, became acquainted with him. A Taste, in common, for rational Subjects, whether Physics, or Metaphysics, and continual Disputations, formed the Bonds of their Friendship. They were mutually serviceable to each other in the Subjects of their Enquiries. Their Contrariety of Tempers formed a compleat and happy Mixture; one by the boldness of his Ideas, fruitful Imagination, and the heat of his Reasonings; and the other by a close Examination, a scrupulous Exactness, and by a discreet ingenious Deliberation examined every Thing.

The *Abbe*, to enjoy *M. Varignon's* Company with greater Ease, lodged with him, and, growing more sensible of his Merit, resolved to give him a Fortune that he might completely pursue his Genius, and improve his Talent. Yet this *Abbe*, a younger Brother of *Normandy*, had but an Income of eighteen Hundred Livres; three Hundred of which he assigned over to *M. Varignon*. This little, which was much with Respect to the Goodness of the Giver, was also much as to the Wants of the Receiver. The one found himself rich in what he had received, and the other more so by what he had given.

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* The *Geometry*, not the *Philosophy*, of *Descartes* is here to be understood.

500 BIOGRAPHIA PHILOSOPHICA.

The *Abbe*, persuaded that he could not do better than to go to *Paris* to study Philosophy, settled there, in 1686, with *M. Varignon*, in the Suburb of *St. Jacques*. There each studied his own Way; the *Abbe*, abandoning tiresome useless Subtilities, principally applied himself to the Study of Man, Manners, and the Principles of Government; whilst *M. Varignon* was wholly taken up with Mathematics.

I,* who was their Countryman, often went to see them, and, sometimes, spent two or three Days with them. They had also Room for a couple of Visitors, who came from the same Province. We joined together with the greatest Pleasure. We were young, full of the first Ardour of Knowledge, strongly united, and, what we were not then, perhaps, disposed to think so great a Happiness, little known. *M. Varignon*, who had a strong Constitution, at least in his youth, spent whole Days in Study, without any Amusement, or Recreation, except walking, sometimes in fine Weather. I have heard him say, that the studying after Supper, as he usually did, he was often surprised to hear the Clock strike two in the Morning; and was much pleased, that four Hours Rest were sufficient to refresh him. He did not leave his Studies with that Heaviness that they usually create; nor with that Weariness that a long Application might occasion. He left off gay and lively, filled with Pleasure and impatient to renew it. In talking of Geometry he would laugh so freely, that it seemed as if he had studied for Diversion. No Condition was so much to be envied as his; his Life was a continual Enjoyment, and he entirely loved Quietness. Yet if one had looked for a happy man, it would have been natural to have searched far from him, and much above him; but it would not have been found except there.

In the solitary Suburb of *St. Jacques*, he did not miss making a Connection with many learned Men, and the most illustrious, such as *du Hamel*, *du Verney*, *de la Hire*. *Du Verney* frequently asked his Assistance in those Part of Anatomy connected with Mechanics; they examined together the Positions of the Muscles, and their Directions; and *M. Varignon* learned a good deal of Anatomy from *M. Du Verney*, which he repayed by the Application of mathematical Reasoning to Anatomy.

At

* *Fontenelle*, to whom we are indebted for this Life,

At Length, in 1687, *M. Varignon* made himself known to the Publick by a *Treatise on New Mechanics*, dedicated to the *Academy of Sciences*. His Thoughts on this Subjects were, in Effect, really new. He discovered Truths and laid open their Sources, Things which at first appear inseparable, but which are yet often divided. In this Work, as a Mechanic, he demonstrated the Necessity of an *Equilibrium*, in such Cases as it happens in, though the Cause of it is not exactly known. This is what *M. Varignon* hath discovered by the Theory of compound Movements; and is what this Essay turns upon. The essential Principles once discovered, the Verity of them flows with a lightful Ease into the Mind. The Connection is, at the same Time, very simple and close; a View of their Production free and agreeable; and this Production being more legitimate in some Sort is also more fruitful.

This new Treatise on Mechanics was greatly admired by the Geometricians, and procured the Author two considerable Places, one of Geometrician in the *Academy of Sciences*, the other of Professor of Mathematics in the *College of Mazarine*; to which he was the first Person raised.

He was led by the natural Bent of his Genius to make his mathematical Enquires as general as possible. A Landskip cannot be properly said to be seen when all its Parts have been viewed separately, it must be contemplated from an Eminence where one Glance may unite a Variety of different Objects in a single Group. The Case is just the same with geometrical Truths, there are a great many to be seen dispersed here and there without any Connection, but, in order to see them at one View, a Man is obliged to soar very high, and that requires both Labour and Address. The general Rules of Algebra are the Eminences from whence the wide extended Country may be observed. Perhaps no Geometrician ever better knew, or has better shewn the Utility of these Rules than *M. Varignon*.

He therefore could not fail to catch eagerly at the Geometry of *Infinitesimals* as soon as it appeared in the World, it is constantly raising itself to the highest Point of View possible to the infinite, and there it takes in an infinite Extent of Space. With what Transport did he see a new Geometry and new Pleasure arise! when that beautiful and sublime Method was attack-
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ed in the Academy itself, (for it could not escape the Fate of all Innovations,) he became one of its most zealous Defenders, and in its Favour he put a Violence upon his natural Character, which abhorred all Contention. He sometimes lamented to me, that this Dispute had interrupted him in his Inquiries into integral Calculation so far, that it would be difficult for him to resume his Disquisition where he had discontinued it. He sacrificed infinitesimals to the Interest of infinitesimals, and gave up the Pleasure and Glory of making a farther Progress in them when called on by Duty to undertake their Defence.

All the printed Volumes of the Academy bear Witness to his Application and Industry. His Works are never detached Pieces, but complete Theories of the Laws of Motion, central Forces, and the Resistance of Mediums to Motion. In these he makes such Use of his Rules, that nothing escapes him that has any Connection with the Subject he treats. Besides the new discovered Truths, others are to be traced in them known before, which, coming from a Variety of different Quarters, conspire to prop his System. These united form a Body and the void Spaces which were left before are soon filled up.

Geometrical Certainty is by no Means incompatible with Obscurity and Confusion, and they are sometimes so great that it is surprising a Geometrician should not miss his Way in so dark and perplexing a Labyrinth. The Works of *M. Varignon* never occasion this disagreeable Surprise, he makes it his chief Care to put every Thing in the clearest Light; he does not as some great Men do, consult his Ease by declining to take the Trouble of being methodical, a Trouble much greater than that of Composition itself; he does not endeavour to acquire a Reputation for Profoundness, by leaving a great deal to be guessed by the Reader.

He was perfectly acquainted with the History of Geometry. He learned it not merely out of Curiosity, but because he was desirous of acquiring Knowledge from every Quarter. This historical Knowledge is, without Doubt, an Ornament in a Geometrician, but it is an Ornament which is by no Means without its Utility. Indeed, it may be laid down as a Maxim, that the more different Ways the Mind is occupied in upon a Subject, the more it improves.

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Though *M. Varignon's* Constitution did not seem easy to be impaired, Affiduity and constant Application brought upon him a great Disease in 1705. Great Abilities are generally dangerous to the Possessors. He was six Months in Danger, and three Years in a languid State, which proceeded from his Spirits being almost entirely exhausted: He told me, that sometimes, when delirious with a Fever, he thought himself in the Midst of a Forest, where all the Leaves of the Trees were covered with algebraical Calculations. Condemned by his Physicians, his Friends and himself, to lay aside all Study, he could not, when alone in his Chamber, avoid taking up a Book of Mathematics, which he hid as soon as he heard any Body coming. He again resumed the Attitude and Behaviour of a sick Man, and seldom had Occasion to counterfeit.

In regard to his Character it should be observed, that it was at this Time that a Writing of his appeared, in which he censured *Mr. Wallis* for having advanced that there are certain Spaces more than infinite, which that great Geometrician ascribes to Hyberbolas. He maintained, on the Contrary, that they were finite. The Criticism was softened with all the Politeness and Respect imaginable; but a Criticism it was, and he had wrote it only for himself. He let *M. Carré* see it, when he was in a State that rendered him indifferent about Things of that Kind, and he, influenced only by the Interest of the Sciences, caused it to be printed in the Memoirs of the Academy of Sciences, unknown to the Author, who thus made an Attack against his Inclination.

He recovered from his Disease and languid Condition, but the Remembrance of what he had suffered did not make him more prudent for the future. The whole Impression of his *Project, for a new System of Mechanics*, having been sold off, he formed a Design to publish a second Edition of it, or rather a Work entirely new, though upon the same Plan, but more extended; so that the Name of *Project* could no longer suit with it. It would be easy to perceive how much Learning he had acquired in the Interval; but he often complained, that he wanted Time, though he was by no Means disposed to lose any. Frequent Visits either of *French* or of Foreigners, some of whom went to see him that they might have it to say they had seen him;

him ; and others, to consult him and improve by his Conversation ; Works of Mathematics, which the Authority of some, or the Friendship he had for others, engaged him to examine, and which he thought himself obliged to give the most exact Account of ; a literary Correspondence with all the chief Geometricians of *Europe*, to whom he could send no Letters but such as were learned and wrote with Care ; for a Man can no more neglect such Friends than the Public ; all this greatly hurted the Book he had undertaken to write. Thus a Man acquires Reputation by having a great deal of leisure Time, and he loses this precious Leisure as soon as he has acquired Reputation. Add to this, that his best Scholars, whether in the *College of Mazarine* or the *Royal College*, for he had a Professor's Place in both, sometimes desired private Lectures of him. The Pleasure it gave him to see them desire Instruction, his Zeal for the Mathematics, his Goodness of Heart, and his Propensity rather to do more than Duty required of him than less, gave them this Right, and freed them from the Apprehension of carrying it too far. He sighed for two or three Months of Vacation, for that was all the leisure Time he had in the Year ; no sooner were they come but he retired to the Country, where his Time was entirely his own, and every Day seemed quickly ended.

Notwithstanding his great Disposition to Peace, at the latter End of his Life he was involved in a Contest. An *Italian Monk*, well versed in Mathematics, attacked him upon Tangents and the Angle of Contact in Curves, such as they are conceived in the Geometry of Infinitesimals. He thought himself under a Necessity of answering, though indeed all indifferent Persons would have thought otherwise ; I do not think I quit the Character of an impartial Historian when I assert that his Reputation ran no Risk, but that was his tenderest Part, or rather all his Sensibility was there ; he answered by the last Memorial he ever gave the Academy, and the only one which turned upon a Dispute. His pacific Disposition was, however, discoverable even there ; he did not, in it, name his Adversary, who had named him every Moment, whom all the World knew, who did not conceal himself, and though Remonstrances were made to him upon the Weakness and Superstition of his Silence, he persisted obstinately to call him the Aggressor ; true it is, he was

not quite so tender of the false Reasonings which he called by their true Name.

In the two last Years of his Life, he was attacked with a Rheumatism which was seated in the Muscles of his Breast; he could not walk for a Time without being obliged to rest himself in order to recover his Breath. This Illness encreased every Day, and all Remedies were ineffectual, which did not at all surprize him. He did not cease from any of his customary Business; and, in fine, after having finished his Lecture at the College of *Mazarine*, on *December 22*, 1722, he died suddenly the following Night, without having shewed any unusual Symptoms of Illness.

His Character was as simple as his superior Understanding could require. He was a Stranger to Jealousy; true it is, he was at the Head of the *French Geometricians*, and one of the greatest Geometricians of *Europe*. It must be owned, however, that when a new Idea was offered to him he was too hasty to object, the Fire of his Genius, the various Insights into every Subject, made too impetuous an Opposition to those that were offered; that it was not so easy to obtain from him a favourable Attention.

The LIFE of LEWIS CARRÉ.

LEWIS CARRÉ was born in the Year 1663. His Father, a substantial Farmer in the Province of *Brie*, dedicated him early to the Church, and applied him to the Studies fittest to qualify him for that State of Life; but Monsieur Carré, after going all the Lengths that could be expected from the most dutiful Son, chose to incur his Father's Displeasure, and be deserted by him, rather than embrace a Profession for which he did not find in himself as strong a Vocation as he thought it required.

Being, by this Means, obliged to leave the University, and look out for Employment in the World, he had the good Fortune of being engaged as an *Emanuelensis* by the famous Father

Mallebranche, and of seeing himself transported all at once from the Mazes of scholastic Darkneſs, to the Source of the moſt brilliant and enlightened Philoſophy. He ſtudied, under this great Man, Mathematicks, and the moſt ſublime Metaphyſicks, and imbibed his Spirit ſo well, that, whereas the Generality of Mankind believe only what they ſee, he appeared to ſee every Thing he believed; ſo much had the Evidence of Reaſon obtained in his Mind its juſt Aſcendant over that of the Senſes.

But difficult as it may be to embrace a Theory that claſhes with the common Appearance of Things, it is much more difficult to obtain a full and peaceable Dominion over the Paſſions, and it is in drawing this Advantage from the new System that *Monſieur Carré's* Glory chiefly conſiſts. His Metaphyſicks, which are a perpetual Union of Philoſophy and Chriſtianity, made him deſpiſe the occaſional Cauſes of Pleaſure to attach himſelf to the only efficient Cauſe of them.

Such an Uniformity of Sentiment between Maſter and Scholar had its natural Effect. Father *Mallebranche* and *Monſieur Carré* ſoon conceived the higheſt Eſteem and warmeſt Friendſhip for each other, and this alone, were other Subjects wanting, would be ſufficient to make the Panegyrick of either.

After ſeven Years ſpent in this excellent School, *Monſieur Carré* found it neceſſary, in order to procure himſelf ſome leſs precarious Eſtabliſhment, to teach the Mathematicks and Philoſophy in *Paris*, but eſpecially that Philoſophy, which, on Account of its Tendency to improve our Morals he valued more than all the Mathematicks in the World. And, accordingly, his greateſt Care was to make Geometry ſerve as an Introduction to his well beloved Metaphyſics, and his Endeavours ſeldom failed but with ſuch as were hardened in their old Systems.

Moſt of *Monſieur Carré's* Pupils were of the fair Sex. The firſt of them, who immediately perceived that his Language was not very elegant and correct, told him pleaſantly, that, as an acknowledgment for the Pains he took to teach her Philoſophy, ſhe would teach him *French*; and he has ſince owned that her Leſſons were of great Service to him. In general, he ſeemed to ſet more Value upon the Genius of Women than that of Men; perhaps, becauſe not being previously duped in Favour of

of any other System, they more readily yielded to his; perhaps because he found them more stedfast in adhering to it; perhaps, in fine, because that natural Propensity, we have towards them, operated in him without his knowing it, and made them appear more Philosophers in his Eyes than they really were. Be that as it will, he never so much as mentioned their Names, and never saw them but with as much Precaution as if it had been on a quite different Errand. His Behaviour to his Pupils in general was as generous, as this to his female Pupils in particular was discreet. He never called twice upon any of them for what they owed him, so that they were at Liberty to use him ill, and, what is more, were sure of being never reproached by him with their ill Usage.

Monsieur Carré was very far from despising the Mathematics, though he gave Metaphysics the Preference over them; and accordingly while he taught both, he took Care to make himself acquainted with all the new Discoveries in the former. This was all his constant Attendance on his Pupils would allow him to do till the Year 1697, when Monsieur Varignon of the Royal Academy of Sciences at Paris, so remarkable for his being extremely scrupulous in the Choice of his *Eleves*, took Monsieur Carré to him in that Station. Soon after, (in the Year 1700,) Monsieur Carré, thinking himself bound to do something that might render him worthy of that Title, published the first compleat Work on the *Calculus Integralis*, under the Title of, *A Method of measuring Surfaces and Solids, and finding their Centers of Gravity, Percussion, and Oscillation*. In his Preface to this Work he mentions it as nothing more than the most simple and easy Method of applying the *Calculus Integralis*, which was saying of it exactly what it deserved. He afterwards, however, discovered some Errors in it, and was great enough to own and correct them in a subsequent Edition.

In a little Time Monsieur Carré became Associate and, at length, one of the Pensioners of the Academy; and, as this was a sufficient Establishment for one, who knew so well how to keep his Desires within just Bounds, he gave himself up entirely to Study, and as he enjoyed a Place of Mechanician, applied himself more particularly to Mechanics. He took a Survey of every Branch relating to Musick, such as the Doctrine

of Sounds, the Description of musical Instruments, &c. He neglected the Practice of Musick as one of the principal Sources of sensual Pleasure, and attended to the Theory of it, merely because it requires a Number of painful Researches. The Reader may meet with some Sketches of his Ingenuity and Industry this Way in the Memoirs of the *Royal Academy of Sciences of Paris*. Mr. Carré likewise composed some Treatises on other Branches of natural Philosophy, and some on mathematical Subjects, all which he bequeathed to the same illustrious Body; but it does not appear that any of them have been as yet published. It is probable, that he was hindered from putting the last Hand to them by a Train of Disorders proceeding from a bad Digestion, which, after harrassing him for five or six Years, at last brought him to the Grave in the forty-eight Year of his Age.

The LIFE of Dr. RICHARD MEAD.

DR. Richard Mead, Archiater to King George II. and the most eminent Physician in his Time, descended from a considerable Family in *Buckinghamshire*, and the Son of Dr. Mead, a celebrated Divine of one of the principal Congregations of Independents in *London*: But being ejected by the *Bartholomew Act*, 1662, he removed to a House in the same Parish; and having a numerous Family and a handsome Fortune, took a private Tutor into his House to assist him in the Education of his Children, thirteen in Number, of whom *Richard*, the Subject of our Biographical History, was the Eleventh, being born in the Parish of *Stepney*, *August 11*, 1673. He continued with the rest of the Family till the pretended Discovery of that called the Fanatic Plot, when the old Gentleman, being accused of some Privity thereto, and knowing the Violence of the Times, thought proper for his Safety (though entirely innocent) to retire to *Holland*, first placing this Son, who had a grammatical Education, for his greater Proficiency in Learning, under the Care of an excellent Master, under whom this Youth soon distinguished

tinguished himself for his great Talents and Vivacity of Parts; and having acquired a sufficient Skill in the *Greek* and *Latin* Languages, he was sent to *Utrecht*, in the Year 1689, to compleat this preparatory Education under the illustrious *Grævius* (to whom his eldest Brother had been before a Pupil.) After three Years Residence at *Utrecht*, he removed to *Leyden*, where he attended *Herman's* Botanical Lectures, and the famous *Pitcairn's* Lectures, on the Theory and Practice of Physic. He spent three Years under this Part of his academical Studies, improving greatly by Conversation, very frequently with this Professor. His eldest Brother, with two other Students, taking a Tour through *Italy*, he likewise joined them, as having a Taste for every Thing great and beautiful, and, at the same Time, a proper Regard to his Improvement in the Profession. At *Florence*, after some Difficulty, he found that Piece of Antiquity called the *Tabula Isiaca*.

At *Padua*, August 16, 1695, he took his Degree of Doctor of Philosophy and Physic, and after spending some Time at *Naples* and *Rome*, he returned home in 1696, when he settled in the House where he was born, and pursued the Practice of his Profession.

In 1702, he published that remarkable Work of his which he had been preparing for some Years, viz. his *Mechanical Account of Poisons*. These Essays were a Credit to our Author at their first Publication; but a much greater Honour he acquired by an Edition, near 40 Years afterward, improved by Experiments and other Helps, retracting whatever Mistakes he had found, hereby setting a noble Example to his own Pupils. Such is the Progress of Science, at every Step we ascend, the Horizon widens, but grows less distinct: We begin with thinking every Thing is to be explained, we end by finding in Reality our own Deficiency. This Observation was never better illustrated than by the System our Author attempted to establish in his second Work, viz. the *Influence of the Sun and Moon upon human Bodies*, which had been admitted by all Antiquity, but it appeared to him to be deduceable from the Principles of planetary Attraction, then lately discovered by Sir *Isaac Newton*. This Piece came out in 1704, when it was thought a considerable Thing to understand the System of that Philosopher. However, our Au-
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thor's Genius, as well as a proper Mixture of Ambition, made him attentive to Philosophical Enquiries, and his Labours were rewarded with growing Honours. The *Analysis*, which he presented to the *Royal Society*, of Dr. *Bonomo's* Discovery in relation to the cutaneous Worm that generates the Itch, together with his Account of Poisons, obtained him a Fellowship in that learned Body. Two Years after, he was chosen one of the Council, which was renewed in 1707, where he continued all his Life; and in *December*, 1717, was chosen by Sir *Isaac* one of the Vice Presidents.

May 5, 1703, he was chosen Physician to *St. Thomas's Hospital*: ——— In 1711, appointed by the Company of Surgeons to read the anatomical Lectures in their Hall; which Offices he discharged for seven Years with much Applause. In the mean Time, he was honoured by the University of *Oxford* with the Degree of Doctor of Physic, by a Diploma dated *December* 4, 1707, probably from Dr. *Radcliffe's* Recommendation, as well as his own amiable Endowments: As his Manners were naturally gentle, his Heart good, his Soul noble, adorned with and susceptible of the best Impression, scorning Flattery and Insincerity even to Princes: And as his great Reputation was unquestionably established, he was called in Consultation to Queen *Ann*, about two Days before her Death, when he frankly and perhaps too freely declared, she would not hold it out long; an Opinion which did not readily gain Credit, or thought by some adviseable to drop: However, he communicated to Dr. *Ratcliffe* more freely, and his Judgment was verified.

April 9, 1716, he was admitted Fellow of the *College of Physicians*, and was afterwards one of the Physicians in the Royal Family, from 1719 to 1724.

In 1723, Dr. *Mead* having in his Turn spoke the *Harveyan* Speech at the *College of Physicians*, they thought proper to publish it in Honour to the Faculty.

On the Accession of the late King *George II.* to the Throne, the Doctor was appointed Physician in ordinary to his Majesty. And not long after, when Dr. *Friend* was committed to the Tower on Suspicion of being concerned in what was called *Atterbury's Plot*, Dr. *Mead*, though attached to the Government by Principle and Gratitude, was pleased to visit him, and
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The Life of Dr. RICHARD MEAD. 511

be one of his Bail for his Enlargement: Nor was the Doctor's Generosity confined only to his physical Brethren; he had a Greatness of Mind which extended to the Studious and Ingenious in all Arts and Sciences, and of every Party.

His Treatise *De Morbis Biblicis*, or the Diseases mentioned in the Bible, was the Product of those Hours which among wise Men constitute the Interval between old Age and Death. — The last, and perhaps most valuable Part of his Works, is his medical Precepts and Cautions. Herein, with a Candour and Simplicity so characteristical to a great Man, he freely communicates all the Discoveries that his long Practice and Experience had opened to his View: And concludes with many salutary Cautions for preserving the Organs of the Body and the Faculties of the Mind perfect and entire, to a good old Age. This may be esteemed a valuable Legacy to Posterity, and shews his great good Intention to be able to account, in such a Manner, for the Employment of his Time, shewed him worthy to live and prepared to die: And his Decline soon after was very visible, no longer able to finish, much less project any Thing: After a short Confinement to his Bed, about three Days, and scarce any Pain, he expired the 16th of *February*, 1754, aged 71, and was buried in the Temple Church. The Inscription he had chosen for his Motto was NON SIBI SED TOTI. The Doctor was twice married, in *July* 1699, to *Ruth* Daughter of *John Marsh*, Merchant in *London*, by whom he had eight Children: — And *August* 14, 1724, he married *Ann* Daughter of *Sir Rowland Alston*, of *Odell*, in *Bedfordshire*, Bart. who survives him, but had no Children. During almost half a Century he was at the Head of his Business, ever studious and active, whereby he acquired, as well as by Marriage, a great Fortune: But his generous and benevolent Temper was constantly exercised in Acts of Charity; Clergymen, and, in general, all Men of Learning were welcome to his House, and the Indigent always to his Advice and frequent Assistance; so that he did not die rich, esteeming his Acquisitions best bestowed for the Encouragement of Learning and public Usefulness. His Library was indeed large and valuable, sparing no Expence for the best and scarce Editions of the most valuable Books, and many of them in the richest Binding, not less in Number than 10,000 Volumes.

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His *Latin, Greek, and Oriental* Manuscripts made no inconsiderable Part of his Literary Monuments. His Collection of Antiques, Medals, Coins, Prints and Drawings, were equalled by none in the Kingdom in private Hands. These Collections sold for several Thousand Pounds, besides his Pictures, which yielded 3400*l*. And his valuable Collection of Books were not confined to his own Use, but freely opened to the Inspection of the Curious: Ingenious Men were sure of finding at Dr. *Mead's* the best Helps in many Difficult Branches of Study, and always made the Encouragement of Artists of all Kinds his Aim, employing many, or purchasing, from any, whatever was curious in its Kind, and might embellish his Collection. The rest of his Character is drawn to Advantage by the Author of the Authentic Memoirs of his Life. See also, *Biographia Britannica*.

The LIFE of ROGER COTES.

ROGER COTES, an excellent Mathematician and Philosopher, was born at *Burbage* in *Leicestershire*, July 10, 1682, of which Place his Father was Rector. He was first placed at *Leicester* School; and about the Age of 12 Years discovered such an Inclination and Genius for the Mathematics, that, when it was known to his Uncle, the Rev. Mr. *John Smith*, he gave him all imaginable Encouragement and Assistance; and prevailed with his Father to send him for some Time to his House, that he might put him forward in those Studies. Here he laid the Foundation of those Sciences, for which he was afterwards so deservedly famous. He removed from thence to *London*, and was sent to *St. Paul's* School, under the Care of Dr. *Thomas Gale*, where he made a great Progress in classical Learning; yet found so much Leisure as to keep a constant Correspondence with his Uncle, not only in the Mathematics, but also in Metaphysics, Philosophy, and Divinity. This Fact was often mentioned by the celebrated Professor *Saunderson*. His next Remove was to *Cambridge*; where, upon the 6th of *April*, 1699, he was admitted of *Trinity College*; and, at *Michaelmas* 1705, chosen Fellow

Fellow of it. He was at the same Time Tutor to *Anthony* Earl of *Harold*, and the Lord *Henry de Grey*, to whom he had the Honour to be related.

In *January*, 1705-6, he was appointed Professor of Astronomy and experimental Philosophy, upon the Foundation of Dr. *Thomas Plume*, Archdeacon of *Rocheſter*; being the first who enjoyed that Office, to which he was unanimously chosen, on Account of his high Reputation and Merits.

He took the Degree of Master of Arts in 1706, and went into Holy Orders in 1713. The same Year, at the Desire of Dr. *Bentley*, he published, at *Cambridge*, the second Edition of Sir *Iſaac Newton's Mathematica Principia Philoſophiæ Naturalis*; and inserted all the Improvements, which the Author had made to that Time. To this Edition he produced an ingenious Preface, in which he explained the true Method of philosophizing, shewed the Foundation on which the *Newtonian* Philosophy was built, and refuted the Objections of all other Philosophers against it.

It may not be amiss to transcribe a Paragraph from this Preface, in which the Editor has given an Answer to those, who supposed, that Gravity or Attraction, in Sir *Iſaac Newton's* System, was in no wise a clearer Principle, and fitter to explain the Phænomena of Nature upon, than the occult Qualities of the Peripateticks; because there are still Philosophers, such as they are, who persist in the same absurd Supposition. Gravity, say the Objectors, is an occult Cause; and occult Causes have nothing to do with true Philosophy. To whom Mr. Cotes replies, that “ Occult Causes are, not those whose Existence is most clearly demonstrated by Observation and Experiment, but those only whose Existence is occult, fictitious, and supported by no Proofs. Gravity therefore can never be called an occult Cause of the planetary Motions; since it has been demonstrated from the Phænomena, that this Cause does really exist. Those rather have Recourse to occult Causes, who make Vortices to govern the heavenly Motions; Vortices, composed of a Matter intirely fictitious, and unknown to the Senses. But shall Gravity therefore be called an occult Cause, and on that Account be banished from Philosophy, because the Cause of Gravity is occult, and as yet undiscovered? Let those, who affirm this,

beware of laying down a Principle, which will serve to undermine the Foundation of every System of Philosophy, that can be established. For Causes always proceed, by an uninterrupted Connexion, from those that are compound, to those are more simple; and when you shall have arrived at the most simple, it will be impossible to proceed farther. Of the most simple Cause therefore no mechanical Solution can be given; for if there could, it would not be the most simple. Will you then call these most simple Causes Occult, and banish them from Philosophy? You may so; but you must banish at the same Time the Causes that are next to them, and those again that depend upon the Causes next to them, till Philosophy at Length will be so thoroughly purged of Causes, that there will not be one left, whereon to build it."

The Publication of this Edition added greatly to the Reputation Mr. Cotes had already acquired, among the greatest Men of the Age, for his profound Knowledge in the abstrusest Parts of the Mathematics: Nor was the high Opinion the Public conceived of him in the least diminished, but rather increased, by several Productions of his own about that Time, which was afterwards known. — He gave a Description of the great Meteor, that was seen on the 6th of *March* 1715-16, which was published in the *Philosophical Transactions*, a little before his Death. He left behind him also some admirable and judicious Tracts, Part of which, since his Decease, have been published by Dr. *Robert Smith*, his Cousin and Successor in his Professorship, now Master of *Trinity College, Cambridge*. — His *Harmonia Mensurarum*, or *Harmony of Measures*, containing a *New Analysis and Synthesis* advanced by the Measures of Ratios and Angles, was published at *Cambridge* in the Year 1722, in Quarto; and dedicated to Dr. *Mead* by the learned Editor, who gives us a copious Account of the Performance itself, the Pieces annexed to it, and of such other of the Author's Works, as are yet unpublished. He tells us, how much this Work was admired by Professor *Saunderson*, and how dear the Author of it was to Dr. *Bentley*. The first Treatise of the Miscellaneous Works annexed to the *Harmonia mensurarum*, is, concerning the Estimation of Errors in mixed Mathematics. The Second is, concerning the differential Method; which he handles in a
Manner

Manner somewhat different from Sir *Isaac Newton's* Treatise upon that Subject, having wrote it before he had seen that Treatise. The Name of the third Piece is *Canonotechnia*, or concerning the Construction of Tables by Differences. The Book concludes with three small Tracts concerning the Descent of Bodies, the Motion of Pendulums in the Cycloid, and the Motion of Projectiles: Which Tracts, the Editor informs us, were all composed by Mr. *Cotes*, when he was very young. He wrote also a Compendium of Arithmetic, of the Resolutions of Equations, of Dioptricks, and of the Nature of Curves. Besides these Pieces in *Latin*, he drew up a Course of hydrostatical and pneumatical Lectures in *English*, which were published by Dr. *Smith* in the Year 1737, and are held in high Repute.

This uncommon Genius in Mathematics died, to the Regret of the University, and all Lovers of that Science, upon the 5th of *June*, 1716, in the very Prime of his Life; for he was advanced no farther than to the thirty-third Year of his Age. And so high an Opinion had Sir I. NEWTON of Mr. *Cotes's* Genius that he used to say — “ *If Mr. Cotes had lived, we had known something.*” He was buried in the Chapel of *Trinity College*; and an Inscription fixed over him, written by the celebrated Dr. *Bentley*, who was his constant Friend and Patron, and runs in the following Terms:

H. S. E.

Rogerus Roberti filius Cotes,
Collegii hujus S. Trinitatis socius,
Astronomiæ et experimentalis philosophiæ
Professor Plumianus:

Qui

Immatura morte præreptus,
Pauca quidem ingenii sui pignora reliquit,
Sed egregia, sed admiranda,
Ex inaccessis matheseos penetralibus
Felici solertiâ tum primum eruta.
Post magnum illum Newtonum
Societatis hujus spes altera
Et decus gemellum.

Cui ad summam doctrinæ laudem
Omnes morum virtutumque dotes
In cumulum accesserunt:

*Eo magis spectabiles amabilesque,
Quod in formoso corpore gratiores venirent.*

*Natus Burbagii in Agro Leicestrienfi
Jul. x. 1682, obiit Jun. v. 1716.*

The LIFE of DR. NICHOLAS SAUNDERSON.

DR. *Nicholas Saunderson*, an illustrious Professor of Mathematics in the University of *Cambridge*, and Fellow of the *Royal Society*, was born in *January 1682*, at *Thurlston* near *Penniston*, in *Yorkshire*, where his Father possessed a small Estate. When he was 12 Months old he was deprived of his Sight, by the Small-Pox, so entirely that he had no more Idea of Light and Colours than if he had been born blind. He was, nevertheless, sent early to the Free-School at *Penniston*, and there laid the Foundation of that Knowledge of the *Greek* and *Roman* Languages, which he afterwards improved so far, by his own Application to the Classic Authors, as to hear the Works of *Euclid*, *Archimedes*, and *Diophantus* read in their original *Greek*.

As soon as he had acquired a grammatical Education, his Father began to instruct him in the common Rules of Arithmetic: Here it was his incomparable Genius first appeared; for he very soon became able to work the common Questions, to make very long Calculations by the Strength of his Memory, and to form new Rules to himself for the more ready solving of such Problems as are often proposed to Learners, more with a Design to perplex than to instruct.

At the Age of Eighteen, our Author was introduced to the Acquaintance of *Richard West*, of *Underbank*, Esq; a Gentleman of Fortune and a Lover of the Mathematics, who, observing Mr. *Saunderson*'s uncommon Capacity, took the Pains to instruct him in the Principles of Algebra and Geometry, and gave him every Encouragement in his Power to the Prosecution of these Studies. Soon after, he became acquainted with Dr. *Nettleton*, who took the same Pains with him: And it was to these two Gentlemen that Mr. *Saunderson* owed his first Institution

tion in the mathematical Sciences: They furnished him with Books, and often read and expounded them to him. But he soon surpassed his Masters, and became fitter to teach, than to learn any Thing from them.

Our Author's Passion for Learning increasing, his Father encouraged it, and sent him to a private Academy near *Sheffield*. Logic and Metaphysics, it seems, made up the principal Learning of this School, which made his Stay short: but remained some Time after in the Country, prosecuting his Studies in his own Way, standing most in Need of good Authors and a Person to read to him, being able, by the Strength of his own Genius to surmount whatever Difficulties occurred. His Education had hitherto been carried on at his Father's Expence, which, from his numerous Family, became a Burden to him: His Friends, therefore, began to think of providing both for his Learning and Support, otherways, his own Inclination led him strongly to *Cambridge*, and at length it was determined he should try his Fortune there, not as a Scholar, but as a Master: For his Friends, observing in him a peculiar Felicity in conveying his Ideas to others, hoped that he might teach the Mathematics with Credit and Advantage even in the University: Or if this Design should not succeed, they promised themselves Success in opening a School for him at *London*.

Accordingly, in the Year 1707, being now 25 Years of Age, Mr. *Saunderson* went for *Cambridge* with Mr. *Joshua Dunn*, then a Fellow-commoner of *Christ College*, where he resided with his Friend, but was not admitted a Member of the College.

The Society were much pleased with so extraordinary a Guest, allotted him a Chamber, the Use of their Library, and indulged him in every Privilege that could be of Advantage to him: But many Difficulties obstructed his Design. He was placed here with but very few Friends, without Fortune, a young Man, untaught himself, to be Teacher of Philosophy in a University where it then flourished in the greatest Perfection. — Mr. *Whiston* was all this Time in the mathematical Professor's Chair, and read Lectures in the Manner proposed by Mr. *Saunderson*; so that an Attempt of this Kind looked like an Encroachment on the Privilege of his Office; but, as a good natured Man, and an Encourager of Learning, he readily consented

sented to the Application of Friends made in Behalf of so uncommon a Person. Mr. *Dunn* had been very assiduous in making his Character known, so that his Fame had in some Measure filled the University: Men of Learning and Curiosity became fond of his Acquaintance; so that his Lecture, as soon as opened, was frequented by many, and, in a short Time, very much crouded: The *Principia Mathematica*, *Optics*, and *Arithmetica Universalis* of Sir *Isaac Newton* were the Foundation of his Lecture; and they afforded a noble Field to display his Genius in. It will be Matter of Surprize to many, that our Author should read Lectures in Optics, Discourse on the Nature of Light and Colours, explain the Theory of Vision, the Effect of Glasses, the Phænomena of the Rainbow, and other Objects of Sight: But if we consider that this Science is altogether to be explained by Lines, and is Subject to the Rules of Geometry, it is easy to conceive that he might be Master of these Subjects.

As Mr. *Saunderson* was instructing the academical Youth in the Principles of the *Newtonian* Philosophy, it was not long before he became acquainted with the incomparable Author, although he had left the University many Years, and enjoyed his frequent Conversation concerning the more difficult Parts of his Works. He lived in Friendship also with the most eminent Mathematicians of the Age, with *Halley*, *Cotes*, *De Moivre*, &c. Upon the Removal of Mr. *Whiston* from his Professorship, Mr. *Saunderson*'s mathematical Genius was so well known, that an extraordinary Step was taken in his Favour, to qualify him with a Degree, which the Statute requires. Upon Application made by the Heads of the Colleges to the Chancellor, then Duke of *Somerſet*, a Mandate was readily granted by the Queen for conferring on him the Degree of Master of Arts, upon which he was chosen *Lucasian* Professor of the Mathematics, November 11, 1711, Sir *Isaac Newton* interesting himself greatly in his Favour. His first Performance, after he was seated in the Chair, was an inauguration Speech made in very elegant *Latin*, and a Style truly *Ciceronean*; for he was well versed in the Writings of *Tully*, who was his Favourite in Prose, as *Virgil* and *Horace* were in Verse. From this Time he applied himself closely to the reading of Lectures, and gave up his whole
Time

Time to his Pupils. He continued among the Gentlemen of *Christ-College* 'till the Year 1723, when he took a House in *Cambridge*, and soon after married a Daughter of the Rev. Mr. *Dickens*, Rector of *Boxworth* in *Cambridgeshire*, by whom he had a Son and a Daughter.

In the Year 1728, when King *George* honoured the University with a Visit, he was pleased to signify his Desire of seeing so remarkable a Person; and accordingly our Professor waited upon his Majesty in the Senate, and was there created Doctor of Laws by royal Favour.

Dr. *Saunderson* was naturally of a strong healthy Constitution; but being too sedentary, and constantly confining himself to the House, he became a Valetudinarian: And in the Spring of the Year 1739, he complained of a Numbness in his Limbs, which ended in a Mortification in his Foot. He died the 19th of *April* that Year, in the 57th Year of his Age, and was buried according to his Desire in the Chancel at *Boxworth*.

He was a Man rather to be admired than loved: He had much Wit and Vivacity in Conversation: So that none could be a better Companion. He had also a great Regard to Truth, and was one of those sincere Men who think it their Duty to speak it at all Times: And therefore his Sentiments on Men and Opinions, his Praises or Censures, his Friendship or Disregard without Partiality or Reserve, which must easily be imagined would raise him up many Enemies: But the Consciousness of his Integrity was superior to the little Occasion of Discomposure from the Censure of others, that he met his approaching End with a Calmness and Serenity not very common.

A blind Man, moving in the Sphere of a Mathematician, seems a Phænomenon difficult to be accounted for, and has excited the Admiration of every Age in which it has appeared. *Tully* mentions it as a Thing scarce credible in his own Master in Philosophy, *Diodotus*; that he exercised himself therein with more assiduity after he became blind; and what he thought next to impossible to be done without Sight, that he professed Geometry, describing his Diagrams so exactly to his Scholars, that they could draw every Line in its proper Direction. *St. Jerom* relates a more remarkable Instance in *Didymus* of *Alexandria*, who, though blind from his Infancy, and therefore ignorant of the
very

very Letters, not only learnt Logic, but Geometry also to very great Perfection, which seems most of all to require Sight. But, if we consider that the Ideas of extended Quantity, which are the chief Objects of Mathematics, may as well be acquired from the Sense of feeling as that of Sight, that a fixed and steady Attention is the principal Qualification for this Study, and that the Blind are by Necessity more abstracted than others; for which Reason, *Democritus* is said to have put out his Eyes, that he might think more intensely. We shall, perhaps, find Reason to suppose, that there is no other Branch of Science so much adapted to their Circumstances.

It was by the Sense of Feeling that Dr. *Saunderson* acquired most of his Ideas at first, and this he enjoyed in great Acuteness and Perfection; as it commonly happens to the Blind, whether by the Gift of Nature, or, as is most probable, by the Necessity of Application: Yet he could not, as some have imagined, distinguish Colours by that Sense, and, having made trial, he used to say it was pretending to Impossibilities: But he could, with great Nicety and Exactness, discern the least Difference of rough and smooth in a Surface, or the least Defect of polish. Thus he distinguished, in a Set of *Roman* Medals, the genuine from the false, though they had been counterfeited with such Exactness as to deceive a Connoisseur who had judged by the Eye. His Sense of Feeling was also very accurate in distinguishing the least Variation in the Atmosphere; and he has been seen, in a Garden, when Observations have been making on the Sun, to take Notice of every Cloud that interrupted the Observation almost as justly as they who could see it. He could tell when any Thing was held near his Face, or when he passed by a Tree at no great Distance, provided there was a calm Air and little or no Wind: These he did by the different Pulse of the Air upon his Face.

An exact and refined Ear are what such are commonly blessed with who are deprived of their Eyes. Our Professor was perhaps inferior to none in the Excellence of his Hearing; he could readily distinguish to the fifth Part of a Note, and by his Performance on the Flute, (which he had learned as an Amusement in his younger Years) discovered such a Genius for Music, as if he had cultivated the Art, would probably have appeared as
wonderful

wonderful as his Skill in the Mathematics. By his Quickness in this Sense he not only distinguished Persons with whom he had ever once conversed so long as to fix in his Memory the Sound of their Voice, but, in some Measure, Places also. He could judge of the Size of a Room into which he entered, of the Distance he was from the Wall; and if ever he had walked over a Pavement in Court, Piazzas, &c. which reflected a Sound, and was afterwards conducted thither again, he could tell where about in the Walk he was placed merely by the Note it sounded.

There was scarce any Part of the Mathematics on which he had not wrote something for the Use of his Pupils: But he discovered no Intention of publishing any of his Works, till the Year 1733, then his Friends, alarmed by a violent Fever that had threatened his Life, and unwilling that his Labours should be lost to the World, importuned him to spare some Time from his Lectures and employ it in finishing some Part of his Works, which he might leave behind him as a valuable Legacy both to his Family and the Public. He yielded so far to these Intreaties as to compose, soon after, his *Elements of Algebra*, which he left perfect, and transcribed fair for the Press. It was published by Subscription at Cambridge, 1740, in two Volumes Quarto, with a good *Mezzotinto* Print of the Author, and an Account of his Life and Character, from whence this is principally collected.

It would be wrong to conclude this Account of Dr. *Saunderson* without mentioning the profound Veneration he had for Sir *Isaac Newton*, always declaring, that the more he read his Works, the more Reason he found to admire the Justness and Care, as well as Happiness of Expression of that incomparable Philosopher. He has left some valuable Comments on his *Principia*, which not only explain the more difficult Parts, but often improve upon the Doctrines, and though far short in their present State of what he would himself have published on the Subject; yet they might be no unacceptable Present to the Public. These are published in *Latin* at the End of his TREATISE on FLUXIONS, which is a valuable Work, and printed since the Author's Death. And his Manuscript Lectures on most Parts of Natural Philosophy, which are not published, must be deemed a great Loss to the Public.

The LIFE of Signor BIANCHINI.

SIGNOR *Bianchini* was born at *Verona* in the Year 1662. We are not told what Rank or Profession his Parents were of. He very early embraced the ecclesiastical State, but not from any ambitious or avaricious Views, as the whole Tenor of his succeeding Conduct has sufficiently demonstrated.

Not content with that Branch of Learning, which every Clergyman is more particularly bound to possess, he made it his Business to be thoroughly acquainted with what are generally considered as the polite ones; and soon made himself Master not only of all the Books written in the learned Languages, but of Medals, Inscriptions, Bas-reliefs, in a Word, all the precious Remains of Antiquity, Treasures common enough in *Italy*, to prove that her Capital had been once that of the whole World.

When he had amassed an almost inconceivable Quantity of this Kind of Riches, he formed the Design of an Universal History, as well ecclesiastical as profane, from the Creation of the World down to his own Times, but without mixing the ecclesiastical with the profane Part. Nay, he carried his Scrupulousness in this Respect so far, as to employ no Materials in the latter which the former alone could furnish him with. History, unsupported by Chronology, must be too inaccurate to satisfy the Mind, and mere chronological Tables in which the Events stand unconnected one with another, too dry to please it. He therefore resolved to unite both, saying, that a Series of musical Notes, however regular, is never so easily retained as when it forms an Air. For this Purpose too he resolved to adorn and illustrate his History at proper Intervals with the Representation of the most curious Monuments of Antiquity relating to the Facts contained in the preceding Portion of it.

But so many Avocations interfered, that he never published but one Volume of this grand and useful Work. This Volume appeared in the Year 1697, under the Title of *La Istoria Universale prorata con Monumenti, et figurata con Simboli de gli Antichi*, that is, An universal History proved by Monuments,
and

and illustrated by the Symbols of the Antients. This, though in Point of Duration, a very small Part of universal History, as it comes no lower than the Ruin of the *Affyrian* Empire, is, in other Respects, one of the most considerable, considering the great Obscurity in which that early Period lies buried; besides, he has handled it in such a masterly Manner as to give us just Cause to regret his not having had Time to complete his Design.

In this Volume the Ages of the profane Part preceding the Deluge, void thro' his not being able to borrow any Thing from the sacred, are filled up with the Invention of the most necessary and useful Arts, according to the most certain Relations, and probable Conjectures of the Ancients. The Ages succeeding the Deluge offer every where a grand yet regular Scene, formed not only by the Testimonies of the best Historians, but by just Reflections drawn from the Nature of Things by the Author himself, who thus gives Life and Soul to what would otherwise be but a vast Heap of inanimate Events. Nothing can exceed his Accounts of the Establishment of the first Nations, their Transmigrations and Colonies; the Origin of the great Monarchies, or Republics; the Navigations of Merchants and of Conquerors. In treating of this last Article, Signor *Bianchini* builds greatly upon what he calls *Thalassocracy*, that is the Empire, or, at least, the free Use of the Sea. The Importance of this *Thalassocracy*, though known and felt in the most early Ages of the World, is now more known and felt than ever it was; and the different Nations of *Europe* seem to agree, that real Power is more the Consequence of Riches gained by peaceful Commerce, than of Extent of Territory gained by violent Conquests. According to Mr. *Bianchini*, it was not the Elopement or Rape of *Helen* that set the *Greeks* and *Trojans* by the Ears, but the Navigation of the *Egean* Sea, and the *Pontus Euxinus*, a much more rational and interesting Subject of Dispute, and the War ended, not by the Destruction of *Troy*, but by a Treaty of Commerce. There are not wanting Monuments of Antiquity to confirm this Conjecture. However, it leads him to a still more surprizing Paradox. This is, that the *Iliad* is no more than an Allegorical History in the oriental Manner. Those Gods, so often objected, in Bar of his Title,

to the divine *Homer*, are fully justified in two Words. They are not Gods, but Men or Nations. *Sesostris*, King of *Arabia*, or the Eastern *Ethiopia*, had conquered *Egypt*, all *Asia Minor*, a considerable Part of *Asia Major*, and after his Death the Princes whom he had rendered tributary, little by little shook off the Yoke. The *Jupiter* of *Homer* is that Successor of *Sesostris*, who reigned during the *Trojan War*. His Dominion over the Gods, that is to say, the Princes his Vassels, is very limited, insomuch that he cannot prevent their taking Part, as their Interest or Passions led them, in the Quarrel between the *Greeks* and *Trojans*. *Juno* is the *Syria*, called the *White*, allied to, in some Measure dependant on, the Eastern *Ethiopia*, and this *Syria* is characterized by the *White Hands* of *Juno*. *Minerva* is the learned *Egypt*; *Mars* a Confederacy of the Inhabitants of *Armenia*, *Colchis*, *Thracia*, and *Thessaly*, and so on. By Means of this Allegory *Homer* is, in Signor *Bianchini*'s Opinion, restored to his Title of Divine; others, probably, will think that he never forfeited it.

The Turns of Mind requisite to form the Scholar and the Mathematician are so opposite, that one very often despises the other; and besides, the Occupations themselves, for Want of Time, are seldom compatible in one Person. This, however was not the Case with Signor *Bianchini*. When Pope *Clement XI.* instituted a Congregation for the Reformation of the Calender, Signor *Bianchini*, whom he appointed their Secretary, composed two Works relative to that grand Undertaking and his new Dignity, in which he had an Opportunity of proving himself both a Scholar and a Mathematician. These Works he published in 1703 under the following Title, *De Calendario et Cyclo Cæsaris, ac de Canone Paschali Sancti Hippolyti Martyris, Dissertationes duæ.* That is, Two Dissertations: One on the *Julian Calender* and Cycle; the other on the Paschal Canon of *St. Hippolite Martyr*. In this Performance, which it would be only disfiguring to attempt giving the Reader any adequate Idea of it, he proves that the Paschal Canon of *St. Hippolite*, which the great *Scaliger* had boldly taxed with Puerility, is the most beautiful Work on the Subject that ever appeared before the Reformation of the Calender by *Gregory XIII.*

Signor

The Life of Signor BIANCHINI. 525

Signor *Bianchini* was likewise employed by the same Pope *Clement XI.* in the Construction of a great Gnomon in the *Carthusian Church at Rome*, like that already constructed by the great *Cassini* in the Church of *St. Petronius at Bologna*. Other Gnomons have been since constructed elsewhere. *Clement* ordered a Medal to be struck to perpetuate the Memory of this useful Erection, and Signor *Bianchini* published an ample Dissertation, *De Nummis & Gnomone Clementino*; that is, on the *Clementine Medals and Gnomon*.

In the Year 1726 there was discovered near *Rome* on the *Ap-pian Way*, a magnificent marble subterraneous Building of three large Halls, whose Walls consisted of a great Number of little Cells like those of our modern Pigeon-houses. Most of these Cells contained, each, four Cinerary Urns, accompanied with Inscriptions of the Name and Office of the Person whose Ashes they contained, all Slaves or Freed-men and Women of the Household of *Augustus*, especially that of *Livia*. On this Occasion Signor *Bianchini* felt all the Joy suitable to a professed Virtuoso, and engaged with great Ardour in the agreeable Task of perpetuating these precious Remains of Antiquity. Accordingly he published the Year following under the Title of *Camera ed Inscrizioni Sepolchrali de' Liberti, Servi, ed Ufficiali della Casa di Augusto, &c.* that is, the Sepulchral Vault and Inscriptions of the Freed-men and Women, the Slaves, and Officers of the Household of *Augustus, &c.* an exact Description of this Pigeon-house, and a Dissertation upon every Thing suggested by the Inscription of it, particularly the several Names of Office, which though expressed in the best *Latin*, considering the Date of them, are a *Latin* now almost entirely unknown. The Number of Persons, whose Ashes are enclosed in this Monument and in another of the same Kind discovered before, and which belonged entirely to the Household of *Augustus*, is made by Signor *Bianchini* to amount to six Thousand, exclusive of what must have been constructed here and there at a greater Distance from *Rome*. This Number will not surprize us, when we are informed, by the Names of Office mentioned in these Inscriptions, into how many Details the Service was divided. One female Slave had nothing to do but weigh out the
Wool

Wool for the Empress's spinning; another to keep her Ear-Rings; another to take Care of her Lap dog.

While Signor *Bianchini* spent the Day as an Antiquarian in examining this sepulchral Monument, he continued to spend the Night as an Astronomer, in examining the Planet *Venus*, whom he had been studying for a great many Years. He set out by endeavouring to ascertain her Parallax by the ingenious Method invented by M. *Cassini* for the Parallax of *Mars*. This Method consists in comparing the Motion of the Planet, whose Parallax is wanted, with some fixed Stars very near it, and that for some considerable Space of Time, but a fair Opportunity of doing it seldom happens. It was, however, Signor *Bianchini's* good Fortune to meet with one in the Beginning of July 1716, when *Venus* and *Regulus* came to the Meridian so nearly together, that he could distinguish them both in the same Field of his refracting Telescope. By three Observations made the 3d, 4th, and 5th, he found by Monsieur *Cassini's* Method, which he confirmed by another, that the Parallax of *Venus* was of 24 Seconds. But, after all, it is his Ingenuity and Industry which we are to admire most upon this Occasion; for by his Observation, the Parallax of the Sun would be 14 Seconds, whereas M. *Cassini* makes it but 10, and Monsieur *de la Hire* but 6.*

Signor *Bianchini* was much more successful in contriving a Method of applying to the Observation of the Spots of *Venus*, a Thing of much more Importance, the Glasses of 100 and 120 Feet Focus made by *Campani* and *Divini*; for all the Tubes constructed for these Glasses were found to bend in the Middle, and Monsieur *Huygens's* Method of using telescopical Glasses without Tubes was attended with much Trouble and many Inconveniencies, insomuch that without Signor *Bianchini*, the Work of those excellent Artists might have been lost to the Public, not yet acquainted with the reflecting Telescope. Signor *Bianchini* brought his Machine to *Paris* in the Year 1712, and exhibited it to the Royal Academy there, who found it, beyond Expectation, simple, portable, manageable, and Expeditious, and therefore gave a Description of it in their Memoirs for

* By Observations of the late TRANSIT of VENUS, the Sun's Parallax is found to be nearly 9 Seconds.

The Life of Signor BIANCHINI. 527

for the Year 1713. By Means of this Machine, Signor *Bianchini* discovered the Spots on the Disc of *Venus* so distinctly, that he thought himself authorized to attribute several Seas, and Streights to that Planet, which he called by the Names of the King of *Portugal*, from whom he had received some Favours, such of the *Portuguese* Generals and Navigators as had most distinguished themselves, and some learned Men of his own Country.

The Fruits of this Discovery of the Spots of *Venus* were that of the Inclination of her Axis to her Orbit, which Signor *Bianchini* found to be 15 Degrees, of her revolving about her Axis in 24 Days 8 Hours, and in fine, the constant Parallelism of her Axis with itself in every Part of her Orbit, like that which *Copernicus* attributed to the Axis of the Earth as necessary in his System, but which has been since ascertained by actual Observation. We have an Account of all these Things in a Work published by him in 1728 under the Title of *Hesperii & Phosphori nova Phænomena, sive Observationes circa Planetam Veneris*; that is, New Phænomena of the Planet *Venus*, or Observations on the Evening and Morning Star. His other Works are, a new Edition of the Lives of the Popes by *Anastatius* the Librarian, in three Volumes Folio, illustrated by a great Number of very learned Researches; and several small Volumes inconsiderable only by their Bulk, some of them are Pieces of Eloquence, and it is said, he did not neglect Poetry. In Fact, his Writings abound with evident Marks of a poetical Genius.

His Book on *Venus* makes mention of a Meridian, which he intended to have traced the whole Length of *Italy*: But after dedicating all his Leisure Hours during the Space of eight Years to the Preparations necessary for so grand an Undertaking, he died, of a Dropsy, without being able even to begin it, in the Year 1729, leaving behind him evident Proofs that he was too great a Philosopher not to be a good Christian. Nothing could surpass his Candour, Affability, and Desire of being useful, which he carried so far, that to satisfy it he never thought much of leaving abruptly the most important Occupations.

In 1705, the *Royal Academy of Science* admitted him among the small Number of her Foreign Associates. *Benedict XIII.* appointed him one of his domestic Prelates, and *Clement XI.* besides

fides the Secretaryship of the Congregation of the Calendar, made him one of his honorary Chamberlains; and Surveyor General of all the Antiquities of *Rome*, which were not to be touched without his Permission. He had, besides, as a Clergyman, some ecclesiastical Benefices. But a great deal more Honour and Profit would not have been too much for one, who knew so well how to employ them.

The LIFE of Monsieur REYNEAU.

CHARLES REYNEAU, now known only by the Name of Father *Reyneau*, was the Son of a Surgeon at *Brissac* in the Province of *Anjou*. In the Year 1676, being about Twenty, he entered himself amongst the Oratorians, a Kind of religious Order, whose Members live in Community without making any Vows, and apply themselves chiefly to the Education of Youth without expecting any Stipend but the bare Necessaries of Life. We are not told in what Manner Monsieur *Reyneau* spent his Time till this Period, yet it is impossible almost to be mistaken in guessing it, from that uniform love of Religion and the Sciences, which so strongly characterized the Remainder of his Life.

Soon after Monsieur *Reyneau* engaged in this laudable Career, his Superiors sent him to teach Philosophy at *Pezenas*, and then at *Toulon*. This was the *Cartesian*, then distinguished all over what we may now call learned *Europe*, as it is to this Day in *Spain* and *Portugal*, by the Name of the modern Philosophy; and consequently required in him some Acquaintance with Geometry, which Acquaintance was afterwards improved into a particular Affection for that Science by the Orders of his Superiors, who, in the Year 1683, sent him to teach the Mathematics at *Angers*.

In this Occupation Father *Reyneau* not content with making himself Master of every Thing worth knowing, which the modern Geometry, so fruitful in sublime Speculations and ingenious Discoveries had already produced, undertook to reduce into one

Body,

Body, for the Use of his Scholars, the principal Theories scattered here and there in *Newton*, *Descartes*, *Leibnitz*, *Bernouilli*, the Acts of *Lèipsic*, the Memoirs of the *Royal Academy of Sciences* of *Paris*, and in other Books perhaps less known; Treasures, which by being so widely dispersed, proved infinitely less useful than otherwise they might have been. The Fruit of this Undertaking was his *Analise démontrée*, or Analysis demonstrated, which he published in 1708.

Though all the Discoveries in modern Geometry are Truths, and consequently, not like the Systems of Historians, Chronologists, and even natural Philosophers, easily reconcileable with one another; yet, considering the immense Variety of the Truths and of the Sources from which they are derived, it must have proved a Work of no small Labour and Ingenuity to unite them all, as it were, into one common Bed, and make them flow from one common Spring; insomuch, that the Public, whatever Admiration it may bestow on those who invent, is perhaps more indebted to those who, like Father *Reyneau*, unite and harmonize, and in so doing shew themselves more particularly intent upon serving Mankind.

Father *Reyneau* called this useful Work of his *Analysis demonstrated*, because he demonstrates in it several Methods, which had not been demonstrated by the Authors of them, or at least not with sufficient Perspicuity and Exactness; for it often happens, that, in Matters of this Kind, one is often clear in a Thing without being able to demonstrate it. Some Persons too have been so mistakingly fond of Glory as to make a Secret of their Demonstrations in order to perplex those, whom it would become them much better to instruct. This Book of Father *Reyneau*'s was so well approved, that it soon became a Maxim, at least in *France*, that to follow him was the best, if not the only Way to make any extraordinary Progress in the Mathematics. This was considering him as the first Master, as the *Euclid* of the sublime Geometry.

Father *Reyneau*, after thus giving Lessons to those who understood something of Geometry, thought proper to draw up some for such as were utterly unacquainted with that Science. This was in some Measure a Condescension in him, but his Passion to be useful made it easy and agreeable. In 1714 he

published a Volume in Quarto on Calculation, under the Title of *Science du Calcul*; of which the then Censor Royal, a most intelligent and impartial Judge, says, in his Approbation of it, that *though several Books had already appeared upon the same Subject, such a Treatise as that before him was still wanting, as in it every Thing was handled in a Manner sufficiently extensive, and at the same Time with all possible Exactness and Perspicuity.* In fact, though most Branches of the Mathematicks had been well treated of before that Period, there were yet no good Elements, even of simple Geometry. Those, who knew no more than what precisely such a Book ought to contain, know too little to complete a good one; and those who knew more, thought themselves, probably, above the Task; whereas Father *Reyneau* possessed at once all the Learning and Modesty necessary to undertake and execute such a Work.

As soon as the *Royal Academy of Sciences* at *Paris*, in Consequence of a Regulation made in the Year 1716, opened its Doors to other learned Men, under the Title of *Free Associates*, Father *Reyneau* was admitted of the Number. The Works, however, which we have already mentioned, are the only ones he ever published, or, probably, ever composed, except most of the Materials for a second Volume of his last, which he left behind him in Manuscript. The last Years of his Life were attended with too much Sickness to admit of any extraordinary Application. He died in the Year 1728, not more regretted on Account of his great Learning, than of his many Virtues, which all conspired in an eminent Degree to make that Learning agreeable to those about him, and useful to the World. The first Men in *France* deemed it an Honour and a Happiness to count him among their Friends. Of this Number were the Chancellor of that Kingdom, and Father *Mallebranche*, of whom Father *Reyneau* was a zealous and faithful Disciple.

The LIFE of NICHOLAS HARTSOCKER.

NICHOLAS HARTSOCKER was born at *Gouda*, a City of *Holland*, in the Year 1656, of a House long known in the Country of *Drenthe*. His Father, a Clergyman, like most other Fathers, applied his son early to the Studies which were fittest to qualify him for the Station he himself filled or some other equally useful ; little dreaming that his Views would be thwarted, as they were, by the Stars and Planets, which little *Hartsocker* used to contemplate, with the greatest Pleasure and Curiosity, both in the Heavens and in all the Almanacks he could lay hold of. And having heard, at the Age of thirteen or fourteen, that it was impossible to understand such Things properly without some Knowledge of the Mathematicks, and finding his Father utterly averse to his engaging in that Branch of Learning, he carefully saved as much as he could of the little Money allowed him for his Recreations in order to be able to acquire it, if possible, with his own Hands.

At length, thinking himself rich enough, he applied to a Teacher of the Mathematicks, who promised to be very expeditious, and kept his Word. However, our young Student's Savings were but just sufficient to procure him six Months teaching; to make the most of so short a Period, he used to sit up whole Nights at his Books, making no Use of his Bed-clothes but that of covering the Windows of his Chamber, for fear the Family should discover what he was about.

His Master had some iron Basons, in which he used to grind, with tolerable Exactness, Optic Glasses of six Feet Focus, and young *Hartsocker* soon caught the Method of performing the Operation as well as his Master. But this was but a Prelude to his future Successes this Way, for one Day happening to present, merely by Way of Amusement, a small Glass Thread to the Flame of a Candle, and observing that the End of it contracted a globular Form, he immediately recollected that a glass Globe always magnified the Objects placed in its Focus, and having seen Microscopes at Mr. *Leuwenhoeck's*, and observed their Construction, he constructed one himself with

the little Globe he had accidentally formed, and which had dropt of itself from the End of the Thread, and trying it upon a Hair, had the unspeakable Satisfaction of finding it a good one, and that he could now make Microscopes almost for nothing. Mr. *Leuwenhoeck*, a Man of no Learning, was the first that discovered this Method of magnifying small transparent Bodies, by Means of small glass Globules placed between them and the Eye.

Mr. *Hartsocker*, now Eighteen, having, among other Objects that came in his Way, examined the human Seed with his new invented Microscopes, was surprized to find it full of little Animals hitherto neither observed, nor even dreamed of by the boldest Naturalists. But he attributed it to some Disorder, and therefore thought no further of it, till having, in obedience to his Father, spent some Years at *Leyden* and *Amsterdam* under the ablest Professors of the *Belles Lettres*, *Greek*, *Philosophy*, and *Anatomy*, he came to *Amsterdam* in 1672 in his Way to *France* where he intended to finish his Studies. Here he resumed his Microscopical Observations, and finding the Appearance of the Human Seed to be still the same, he had the Boldness to communicate his Discovery to his Master of Mathematicks and another Friend, who verified it. They then extended their Researches to the Semen of Dogs, Cocks and Pigeons, and found Animalcules in every one of them; with this Difference, that whereas in that of Men and Dogs they are almost alike, and resemble young Frogs, with large Heads, long Tails, and a very quick Motion, those of the Cock and Pigeon appear like Eels or Worms. Nothing of the Kind was to be found in Females.

When these three Confidents of Nature shewed this Phænomenon, they gave out that Spittle was the Substance in which it appeared. But it is certain, that Spittle contains no such Thing, so that it must have been out of mere Shame not to see what had been observed by others, that Mr. *Leuwenhoeck* wrote to one of his Friends, that he had observed a great Number of Animalcules in human Spittle.

Monfieur *Huygens* having heard of these Animalcules in a Tour he made to the *Hague* for the Recovery of his Health, and expressed a great Desire of seeing them, Mr. *Hartsocker*, proud
of

of an Opportunity of being acquainted with so great a Man, immediately set out from *Amsterdam* to wait upon him, and let him know what the Liquor containing these Animalcules really was. In Return for this Confidence and Civility Monsieur *Huygens* promised Mr. *Hartsocker* Letters of Recommendation for *Paris*, but thinking better of it, took him there along with himself in the Year 1678. But their Friendship soon met with a terrible Shock; Monsieur *Huygens* published, in the *Journal des Scavants*, that he had made some very curious Discoveries by Means of a new invented Microscope, and principally that of the Animalcules, without making the least Mention of Mr. *Hartsocker*, who, to defend his Right, thought it high Time to own himself the first Inventor of the new Microscope in question, and the first Observer of the Animalcules discoverable by it. This encreased the Number of Enemies which Monsieur *Huygens's* Merit had already created; and all, taking Advantage of Mr. *Hartsocker's* Resentment, not only instigated him to fall upon Mr. *Huygens* in Print, but, as he was not yet Master enough of the *French* to do it himself, offered him their Pens for that Purpose; and every one of them threw their Shaft against Monsieur *Huygens*.

But the Publisher of the *Journal des Scavants*, in which they intended their Memoir should be inserted, had the Precaution to send it to Mr. *Huygens*, who, after reprimanding Mr. *Hartsocker*, as he deserved, for suffering himself to be thus made a Tool of, drew out a Memoir for the Journal, in which he did him all the Justice he could desire, leaving him ashamed, as he has himself since owned, of so rash a Proceeding, which, however, the Heat of Youth, and Fondness of Glory, but above all his ingenious Confession of it, may serve to palliate.

Mr. *Hartsocker* having observed that the telescopical Glasses of the Observatory at *Paris* were not large enough, however excellent in other Respects, made one larger, and carried it to Mr. *Cassini*, who found it worth nothing. A second succeeded no better, at last, a third was found tolerable. This Perseverance made Mr. *Cassini* foretel, that this young Man, if he went on as he set out, would do great Things; and the Prediction itself was, perhaps, the Cause of its Accomplishment. Mr. *Hartsocker*, encouraged by it, soon made good Glasses of all
Sizes,

Sizes, and at length one of six hundred Feet Focus, which, on Account of its Rarity, he never would part with. In Regard to these Glasses of so long a Focus, he one Day told Monsieur *Varignon* and the Abbe *St. Pierre*, that he thought it impossible to form them in a Bason, but that by trying Pieces of Glas intended to be quite flat, one might happen to meet with some that were Segments of a Sphere of a very long Radius, and that he had in this Manner light upon one of twelve hundred Feet Focus; that this Sphericity depended upon some insensible Unevenesses in the Tables of polished iron upon which the melted Glas is stretched out, or on the Manner of loading the Glasses to polish them one against another; that these Trials were more tedious than difficult. And this was all they could get out of him on the Subject.

In 1694, being at *Paris*, he there published his first Work, under the Title of *Essai de Dioptrique*, an Essay on Dioptricks. In this Work he delivers, demonstrated with great Perspicuity, the whole Theory of that Science, as far as it is conversant about spherical Glasses, for he rejects all other Figures as useless. He then adds the Methods, many of them peculiar to himself, which, however, he speaks out without Reserve, of grinding and polishing Glasses, and the Names and Quantities of the Ingredients to be made use of for forming them. Had he done no more, he would have fulfilled his Title; but he goes still further. A general System of Refraction, along with his Experiments, lead him to the different Refrangibility of the Rays of Light, and he pretends to have been the first to assign their different Velocities as the Cause of it.

Thus his Essay on Dioptricks is likewise an Essay on the first Principles of natural Philosophy. He reckons but two Elements, one a Substance, infinite, perfectly fluid, always in Motion, and no Part of which is ever perfectly separated from the rest; the other a Collection of little Bodies different in Size and Figure, perfectly hard and unalterable, confusedly swimming in the fluid Element, where they meet, unite, and become the different sensible Bodies. With these two Elements he forms every Thing, and accounts for the Weight and Hardness of Bodies, as he does elsewhere, from the same System, for their Elasticity.

Led, at length, by the general Phænomena of Nature, to the Formation of the Sun, the Planets, and Comets, he advances, that the Comets are Spots of the Sun, ponderous enough to have been discharged with great Impetuosity by this great Globe of Fire, that after they have reached to a certain Distance they fall back into the Sun, which absorbs them again, and either dissolves them, or sends them upon another Journey. But this Doctrine of his is, at present, universally exploded. The Nature of the Comets is now, in general, well known, and even the Revolution of some of them in a great Measure ascertained. Allowing the Stars to be the Suns of so many different Systems, the Comets seem to be the Links, as it were, intended by the great Creator to unite them all.

Mr. *Hartsocker* then gives a History of the several Discoveries made in the Heavens by Means of the Telescope, with Reflexions upon so many strange and unforeseen Phænomena; and concludes with an Account of microscopical Observations, in which one may be sure his Animalcules are not forgot. He considers them as swimming in the Air in great Numbers, so as to be constantly entering the Bodies of Men, and other Animals in the act of Respiration and Deglutition, and proceeding, in the Species adapted to them, to those Parts from whence they are to pass into the Eggs of the Females. Mr. *Leibnitz* was weak enough to think of improving upon this System by fancying that these primitive Animals never perished, but that, after escaping from that coarse Covering, that Kind of Mask, which, for Example, made Men of them, they launched, in their primitive Form, into the Air, and there continued roving about till more favourable Accident converted them again into Men.

This Work procured Mr. *Hartsocker* the Esteem of many Men of Learning, particularly Father *Mallebranche* and the Marquis *de l' Hopital*, who, finding him well versed in the old Geometry, would fain have gained him over to the new Geometry, of Infinites, of which they themselves were so full: But he considered it as of too little Service in Natural Philosophy, his favourite Study, to be converted by their Arguments. For the same Reason he made very little of the abstruser Parts of Algebra, which, according to him, were of no Use to some who

ran so much after them, than that of procuring them the Glory of being unintelligible to the Bulk of Mankind. No doubt, if we consider Geometry merely as an Instrument of Natural Philosophy, there is seldom any Necessity for its being so very exquisite. But then Geometry is far from being a mere Instrument; it possesses a sublime Beauty independent of any Use that can be made of it. If, therefore, Mr. *Hartsocker* was afraid, as he used to say, of having his Thoughts diverted from Natural Philosophy, he had some Reason to fly the Charms of the new Geometry.

Encouraged by the Success of his *Dioptrics*, he two Years after published, at *Paris*, his *Principes de Physique*, or Principles of Natural Philosophy, in which he explains at large the System he had already given in Miniature, adding to it his own Sentiments and those of many others on some Subjects which he had not before handled, so as to form a pretty compleat Course of Natural Philosophy, at the same Time that, by avoiding too great Minuteness, he rendered it sufficiently perspicuous.

On the Revival of the *Royal Academy of Sciences* at *Paris*, in 1699, he was named a Foreign Associate, and was soon after chosen Member of the *Royal Society* of *Berlin*. But, what is very remarkable, he never gave himself either of these Titles, nor any other, in any of the Works he afterwards published. It is probable, however, that they were of some Service to his Reputation at least, especially on the following Occasion. *Peter* the Great, on his Arrival at *Amsterdam*, having desired the Magistrates of that City to let him have somebody capable of instructing him, and opening to him the Source of those Branches of Learning he was desirous of acquiring, these Gentlemen pitched upon Mr. *Hartsocker* for that Purpose; and he won the Czar's Affections to such a Degree, that that Monarch would have prevailed upon him to follow him to *Moscovy*. But the Length of the Journey for a numerous Family, and the Difference between the *Russian* Manners and those of the People among whom he had hitherto lived, hindered him from accepting the Czar's Proposal. The Magistrates of *Amsterdam*, to acknowledge the Honour he had done to their Choice of him upon this Occasion, erected a small Observatory for him

him on one of their Bastions. This was rewarding him in a distinguished Manner though at little Expence.

In the Year 1704, after three Years Sollicitation by the Elector Palatine *John William*, a Lover of Learning and learned Men, he repaired to the Court of that Prince, who appointed him his first Mathematician, and honorary Professor of Philosophy in the University of *Heidelberg*. In this Station it was, that being informed by the Elector, of that surprizing Phænomenon, the Re-production of the Claws of Lobsters, and finding himself unable to Account for it mechanically, he imagined that the Lobsters were possessed of a *plastic* Soul, which had the Art of renewing their Claws, and soon proceeded so far as to attribute those plastic Souls to all other Animals, Man not excepted. But as in Man, and many other Animals, these plastic Souls were not known to produce new Members, rather than that they should be idle, he assigned them the Task of forming the Animalcula which perpetuate the Species; and this new System, not unlike Mr. *Cudworth's*, except in its attributing Intelligence to its plastic Souls, pleased Mr. *Hartsocker* in the Beginning so much, that he openly retracted his former Opinion of them as *strange and absurd*, Expressions which the most ingenious Authors seldom employ. But at Length, unable to find any satisfactory Answer to the terrible Objections started to this his new Conceits, he found himself obliged to give them up as he had done his first.

After publishing, in 1707 and 1708, in two Volumes, the Lectures he had given the Elector Palatine, under the Title of *Conjectures Physiques*, or Physical Conjectures, a Work in the same Taste with his Dioptrics and physical Essays already mentioned, containing Word for Word many Things already delivered in them, he took his Leave, for a Time, of his Electoral Highness in order to visit the Learned in other Part of *Germany*, or study Natural History, and Mines in particular. At *Cassel* he repeated the Experiments made by Mr. *Homburg* with the Langrave's Burning-glass constructed by Mr. *Tschirnhaus*, but without being able to vitrify even Lead, insomuch that he absolutely denied the Fact, affirming that what Monsieur *Homburg* took for vitrified Gold was a Substance issuing from the

Charcoal that supported it mixed perhaps with some of the heterogeneous Parts of the Metal itself.

From *Hesse Cassel*, where his Honor and Disinterestedness got the better of all the Temptations which the Langrave could decently throw in his Way to exchange his Service for that of the Elector Palatine, Mr. *Hartsocker* repaired to *Hanover*, where Mr. *Leibnitz*, the professed Friend of all Men of Learning, presented him to the Elector, afterwards *George I.* and the Electoral Princess, the late Queen, so famous for her Talents and good Taste, who gave him a very gracious Reception. About this Time, the Elector Palatine hearing speak of the Burning-glass of Monsieur *Tschirnhaus*, asked Mr. *Hartsocker* if he could make him such a one. Upon this Mr. *Hartsocker*, caused three to be cast in the Glass-house at *Newbourg*, and having soon finished them, the Elector presented him with the largest, which was three Feet and five Inches *Rhinland* Measure in Diameter, nine Feet Focus, and this Focus perfectly circular, of the Size of a *Louis D'Or*, and so ponderous, that two Men had much ado to move it.

In 1710 he published a Volume intitled *Eclaircissements sur les Conjectures Physiques*, being Answers to Objections most of which he attributes to Mr. *Leibnitz*, and two Years after he published another Volume by Way of Sequel to it, and in 1722 a Collection of several separate Pieces on the same Subject. In these three Works he attacked, very freely, several respectable Names in the Republic of Letters, protesting all the while, that if he did not esteem them, he would have given himself no Trouble about them, and that they were very wellcome to criticize upon him in their turn. But in Spite of these Protestations, there appears a great itch for carping, and no small Degree of Virulence in his Manner of treating them. Neither *Newton*, nor *Leibnitz*, nor *Huygens*, nor the other Members of the *Royal Academy of Sciences at Paris*, escaped him on this Occasion. The Academy, however, notwithstanding such Behaviour, continued to consider him as one of her Members, subject to Fits of ill Humour, and the several Members, instead of answering him, stuck to their Researches as of much more Consequence to the Public.

In the second Work he takes up and extends his System of Plastic Souls. In Man, according to him, the rational Soul issues its Orders, and a *vegetative* Soul, which is the plastic, not only intelligent, but more intelligent than even the rational, immediately executes these Orders, besides superintending or carrying on the whole animal Œconomy of the Circulation of Liquids, Nutrition and Accretion, Operations, in his Opinion, above the Reach of mere mechanics. But it was immediately objected that rational Soul; that vegetative Soul, is ourselves, and how can we do all these Things without knowing it? This Difficulty he solves by a Comparison, which is at least ingenious. Suppose, says he, a dumb Man alone in a Room, and Servants placed in the adjacent Rooms to wait upon him. He is made to understand that when he has a Mind to eat, he has only to strike the Floor with his Stick. Accordingly he strikes, and immediately sees his Table covered with Dishes. Now how can he conceive that this Noise, which he has not heard, and of which he has not even any Idea, should have brought the Servants to him? Mr. *Hartsocker* not content with attributing these intelligent plastic Souls to Men, and Animals, now gives them to Plants, nay and the celestial Bodies; Beings which one would imagine had been exploded never to make their Appearance again. But this is but one Instance out of many, that there was no Opinion in the antient Philosophy so much proscribed as to despair of appearing again on the Stage of the learned World.

The Elector Palatine dying in 1716, Mr. *Hartsocker* quitted the Palatine Court, the Year following, when the Dowager Electress, a Princess of the House of *Medicis*, in whom a Taste for Learning was hereditary, returned to *Italy*, her native Country. As soon as the Landgrave of *Hesse* saw him disengaged, he did him the Honour to solicit him a second Time to come and reside with him. But Mr. *Hartsocker* thought his Days too few to spend in a Court, where it is impossible for a Philosopher not to think himself often in a strange Climate. He therefore removed to *Utrecht*, where he undertook a Course of natural Philosophy, and made an Extract of all the curious and useful Observations buried here and there among a Heap of useless Matter in Monsieur *Leuwenhoeck's* Letters. And having received some

Reproaches from *Paris* on Account of the Freedoms he had taken with the *Royal Academy of Sciences* of that City, he began an Apology for them, but his Constitution coming to break all at once, even fast, he had not Time to finish it. He died in the Year 1725. He was brisk, facetious, obliging, and of an easy Temper which false Friends often abused, and these Qualities are the best Apology for the Excesses into which a Spirit of Criticism, too often apt to degenerate into ill Nature, has hurried him in Many of his Works.

The LIFE of Monsieur MARALDI.

JAMES PHILIP MARALDI was born in the Year 1665 at *Perinaldo* in the County of *Nice*, a Place already honoured by the Birth of his maternal Uncle the famous *Cassini*.

After going with his Applause through the usual Course of Studies, he applied himself through Taste to the sublimer Sciences, particularly the Mathematicks, and had made such Progress in them by the Age of twenty-two, that his Uncle, who had been settled in *France* a long Time, invited him there in the Year 1687, in order to cultivate himself so promising a Genius, and make it known in a Country where useful Talents both in Natives and Foreigners were now so much cherished.

Monsieur *Maraldi* no sooner applied himself to the Contemplation of the Heavens, than he conceived the Design of forming a Catalogue of the fixed Stars, the Foundation of all the astronomical Edifice. These Bodies, though they have indeed some Motion, yet because that Motion is extremely slow, and the Quantity of it tolerably well ascertained, and likewise because they always retain their Situation in Respect to one another, are considered as so many fixed Points, to which all the Motions performed under them are referred. From hence it appears of what Consequence it is to be well acquainted with them; but then it is equally difficult and laborious. The Watchings, upon which the Learned and even the Poets value them-

themselves so much, taken in the most literal Sense are nothing to those of an Astronomer stationed in the open Air and at all Seasons. However, Monsieur *Maraldi*, though at no small Expence, that of his Health, became so intimate with the fixed Stars, that on being shewn any one of them however small, he could immediately tell what Constellation it belonged to, and its Place in that Constellation. He has been known to discover those small Comets, which Astronomers often take for the Stars of the Constellation in which they are seen, for want of knowing precisely what Stars the Constellation consists of, when others, on the same Spot, and with Eyes directed equally to the same Part of the Heavens, could not for a long Time see any Thing of them.

In 1700 he engaged under Monsieur *Cassini* in the Prolongation of the *French* Meridian to the northern Extremity of *France*, and had no small Share in compleating it. He then set out for *Italy*, where *Clement XI.* happy to possess an Astronomer formed under Monsieur *Cassini*, invited him to assist at the Assemblies of the Congregation then sitting in *Rome* to reform the Calendar. Mr. *Bianchini* availed himself of his Assistance to construct the great Meridian of the *Carthesian* Church in that City. In 1718 Monsieur *Maraldi*, with three other Academicians prolonged the *French* Meridian to the southern Extremity of that Kingdom.

These were all his out-of-Door Occupations, for he spent most of his Time in waiting upon the heavenly Bodies within the Walls of the Observatory of *Paris*, but with a Success equal to the Fatigue of it, as, independent of his Catalogue, appears by the Pieces of his published in the *Memoirs of the Royal Academy of Sciences* of that City. These consist in daily Observations, and others for which Opportunities seldom offer, such as the Phases of *Saturn's* Ring, the Returns of the fixed Stars; ingenious Applications of the Methods laid down by Monsieur *Cassini*; Verifications of Theories with which it is of Consequence to be acquainted; and lastly, Corrections of other Theories susceptible of Improvement. As to his Catalogue of fixed Stars he never published it. Just as he had placed a Mural Quadrant on the Terras of the Observatory, in order to determine some towards the North and the Zenith, he fell sick,

sick, and in Spite of the greatest Abstemiousness, a Remedy which he had hitherto employed with Success, and the only one he relied upon, he died the 1st of *December*, 1729.

His Character was that which the Sciences generally give to those who give themselves up entirely to them, Seriousness, Simplicity of Manner, and Uprightness. But the shining Part of it was his Gratitude to his Uncle Monsieur *Cassini*, who had another Son in him.

When Monsieur *Maraldi* amused himself it was with Natural History. His most important terrestrial Observations were upon Bees, which, though to him in Comparison of his celestial Observations, but a mere Relaxation, would have been reckoned by others a very laborious Task. They are inserted in the *Memoirs of the Royal Academy of Sciences* for the Year 1712.

The LIFE of COLIN MACLAURIN.

COLIN MACLAURIN, a most eminent Mathematician and Philosopher, was the Son of a Clergyman, and born at *Kilmoddan* in *Scotland*, in *February* 1698. He was sent to the University of *Glasgow* in 1709, where he continued five Years, and applied himself to Study in a most intense Manner. His great Genius for mathematical Learning discovered itself so early, as at twelve Years of Age, when having accidentally met with an *Euclid* in a Friend's Chamber, he became in a few Days Master of the first six Books without any Assistance; and it is certain, that in his sixteenth Year he had invented many of the Propositions, which were afterwards published under the Title of *Geometrica Organica*. In his fifteenth Year, he took the Degree of Master of Arts; on which Occasion he composed and publicly defended a Thesis, *On the Power of Gravity*, with great Applause. After this he quitted the University, and retired to a Country-seat of his Uncle, who had the Care of his Education, for his Parents had been dead some Time; and here he spent two or three Years in pursuing his favourite Studies; but in 1717, he offered himself a Candidate for the Professorship

ship of Mathematicks in the Marishal-college of *Aberdeen*, and obtained it after a ten Day's Trial with a very able Competitor. In 1719, he went to *London*, where he became acquainted with Dr. *Hoadly*, then Bishop of *Bangor*, Dr. *Samuel Clarke*, Sir *Isaac Newton*, and other eminent Men; at which Time also he was admitted a Member of the *Royal Society*: And in another Journey in 1721, he contracted an Intimacy with *Martin Folkes*, Esq; who was the President of it, which lasted to his Death.

In 1722, Lord *Polwarth*, Plenipotentiary of the King of *Great-Britain*, at the Congress of *Cambray*, engaged Mr. *Maclaurin* to go as Tutor and Companion to his eldest Son, who was then to set out on his Travels. After a short Stay at *Paris*, and visiting some other Towns in *France*, they fixed in *Lorraine*; where Mr. *Maclaurin* wrote his Piece *On the Percussion of Bodies*, which gained the Prize of the *Royal Academy of Sciences*, for the Year 1724. But his Pupil dying soon after at *Montpellier*, he returned immediately to his Profession at *Aberdeen*. He was hardly settled here when he received an Invitation to *Edinburgh*, the Curators of that University being desirous that he should supply the Place of Mr. *James Gregory*, whose great Age and Infirmities had rendered him incapable of teaching. Mr. *Maclaurin* had some Difficulties to encounter, arising from Competitors, who had good Interest with the Patrons of the University, and also from the Want of an additional Fund for the new Professor; which, however, at length, were all surmounted, upon the receipt of two Letters from Sir *Isaac Newton*. In one, addressed to Mr. *Maclaurin*, with Allowance to shew it to the Patrons of the University, Sir *Isaac* expresses himself thus: "I am very glad to hear, that you have a Prospect of being joined to Mr. *James Gregory*, in the Professorship of the Mathematics at *Edinburgh*; not only because you are my Friend, but principally because of your Abilities; you being acquainted as well with the new Improvements of Mathematicks as with the former State of those Sciences. I heartily wish you good Success, and shall be very glad to hear of your being elected." In a second Letter to the then Lord Provost of *Edinburgh*, he writes thus: "I am glad to understand, that Mr. *Maclaurin* is in good repute amongst you for his Skill in Mathematicks, for I think he deserves it very well: And to satisfy
you

you that I do not flatter him, and also to encourage him to accept the Place of assisting Mr. Gregory, in order to succeed him; I am ready, if you please to give me Leave, to contribute 20*l.* per Annum towards a Provision for him; till Mr. Gregory's Place becomes void, if I live so long; and I will pay it to his Order in London."

In November 1725, he was introduced into the University; as was, at the same Time his learned Colleague and intimate Friend, Dr. Alexander Monro, Professor of Anatomy. After this, the Mathematical Classes soon became very numerous; there being generally upwards of 100 young Gentlemen attending his Lectures every Year; who being of different Standings and Proficiency, he was obliged to divide them into four or five Classes, in each of which he employed a full Hour every Day, from the first of November to the first of June. In the first Class, he taught the first six Books of *Euclid's Elements*, plain Trigonometry, practical Geometry, the Elements of Fortification, and an Introduction to Algebra. The second studied Algebra, the 11th and 12th Books of *Euclid*, Spherical Trigonometry, Conic Sections, and the general Principles of Astronomy. The third went on in Astronomy and Perspective, read a Part of Sir *Isaac Newton's Principia*, and had a Course of Experiments for illustrating them performed: He afterwards read and demonstrated the Elements of Fluxions. Those in the fourth Class read a System of Fluxions, the Doctrine of Chances, and the rest of Sir *Isaac Newton's Principia*. Besides the Labours of his public Profession, he had frequently many other Employments and Avocations. If an uncommon Experiment was said to have been made any where, the curious were desirous of having it repeated by Mr. Maclaurin: If an Eclipse or Comet was to be observed, his Telescopes were always in Readiness.

In 1734, Dr. Berkeley, Bishop of Cloyne, published a Piece called, *The Analyst*; in which he took Occasion, from some Disputes that had arisen concerning the Grounds of the fluxionary Method, to explode the Method itself, and also to charge Mathematicians in general with Infidelity in Religion. Mr. Maclaurin thought himself included in this Charge, and began an Answer to the Bishop's Book: But, as he proceeded, so many Discoveries, so many new Theories and Problems occurred

red to him, that instead of a vindictory Pamphlet, his Work came out a complete System of Fluxions, with their Application to the most considerable Problems in Geometry and Natural Philosophy. This Work was published at *Edinburgh* in 1742, in two Volumes in Quarto; and as it cost him infinite Pains, so it is the most considerable of all his Works, and will do him immortal Honour. In the mean Time, he was continually obliging the Public with some Performance or Observation of his own; many of which were published in the fifth and sixth Volumes of the Medical Essays, at *Edinburgh*. Some of them were likewise published in the *Philosophical Transactions*, as the following: 1. Of the Construction and Measure of Curves, N°. 356. 2. A new Method of describing all Kinds of Curves, N°. 359. 3. A Letter to *Martin Folkes*, Esq; on Equations with impossible Roots, *May* 1726, N°. 394. 4. Continuation of the same, *March* 1729, N°. 408. 5. *December* the 21st, 1732, On the Description of Curves; with an Account of farther Improvements, and a Paper dated at *Nancy*, *November* 27, 1722, N°. 439. 6. An Account of the Treatise of Fluxions, *January* 27, 1742, N°. 467. 7. The same continued, *March* 10, 1742, N°. 469. 8. A Rule for finding the Meridional Parts of a Spheroid with the same Exactness as of a Sphere, *August*, 1741, N°. 461. 9. Of the Basis of the Cells, wherein the Bees deposit their Honey, *November* 3, 1743, N°. 471.

In the Midst of these Studies, Mr. *Maclaurin* was always ready to lend his Assistance in contriving and promoting any Scheme, which might contribute to the Service of his Country. When the Earl of *Morton* set out, in 1739, for *Orkney* and *Shetland*, to visit his Estates there, he desired Mr. *Maclaurin* to assist him in settling the Geography of those Countries, which is very erroneous in all our Maps; to examine their Natural History, to survey the Coasts, and to take the Measure of a Degree of the Meridian. Mr. *Maclaurin*'s Family Affairs, and other Connections, would not permit him to do this: He drew however a Memorial of what he thought necessary to be observed, furnished the proper Instruments, and recommended Mr. *Short*, as a fit Operator for managing them. Mr. *Maclaurin* had still another Scheme for the Improvement of Geography and Navigation, of a more extensive Nature;

which was, the opening a Passage from *Greenland* to the *South Sea* by the North Pole. That such a Passage might be found, he was so fully persuaded, that he has been heard to say, if his Situation could admit of such Adventures, he would undertake the Voyage, even at his own Charge. But when Schemes for finding it were laid before the Parliament in 1744, and himself consulted by several Persons of high Rank, concerning them, before he could finish the Memorials he proposed to send, the Premium was limited to the Discovery of a North-west Passage: And Mr. *Maclaurin* used to regret, that the Word West was inserted, because he thought that Passage, if at all to be found, must lie not far from the Pole.

Mr. *Maclaurin* is said to have been a very good, as well as a very great Man, and worthy of Love as well as Admiration. His peculiar Merit, as a Philosopher, was, that all his Studies were accommodated to general Utility; and we find, in many Places of his Works, an Application even of the most abstruse Theories, to the perfecting of mechanical Arts. He had resolved, for the same Purpose, to compose a Course of practical Mathematics, and to rescue several useful Branches of the Science from the bad Treatment they often meet with in less skilful Hands. But all this his Death prevented; unless we would reckon, as a Part of his intended Work, the Translation of Dr. *David Gregory's Practical Geometry*, which he revised, and published with Additions, in the Year 1745. In his Life-time, however, he had frequent Opportunities of serving his Friends and his Country, by his great Skill. Whatever Difficulty occurred concerning the constructing or perfecting of Machines, the Working of Mines, the Improvement of Manufactures, the conveying of Water, or the Execution of any other public Work, Mr. *Maclaurin* was at Hand to resolve it. He was likewise employed to terminate some Disputes of Consequence, that had arisen at *Glasgow*, concerning the gauging of Vessels; and for that Purpose presented to the Commissioners of Excise two elaborate Memorials, with their Demonstrations, containing Rules by which the Officers now act. He made also Calculations, relating to the Provision, now established by Law, for the Children and Widows of the *Scotch* Clergy, and of the Professors in the Universities, intitling them to certain Annuities and

Sums,

The Life of COLIN MACLAURIN. 547

Sums, upon the voluntary annual Payment of a certain Sum by the Incumbent. In contriving and adjusting this wise and useful Scheme, Mr. *Maclaurin* bestowed a great deal of Labour, and contributed not a little towards bringing it to Perfection. It may be said of such a Man as Mr. *Maclaurin*, that “He lived to some Purpose;” which can hardly be said of those, how uncommon soever their Abilities and Attainments, who spend their whole Time in abstract Speculations, and produce nothing to the real Use and Service of their Fellow-creatures.

Of Mr. *Maclaurin*’s Works, we have mentioned his *Geometria Organica*, in which he treats of the Description of Curve Lines by continued Motion. We need not repeat what has been said concerning his Piece; which gained the Prize of the *Royal Academy of Sciences* in 1724. In the Year 1740, the Academy adjudged him a Prize, which did him still more Honour, for solving the Motion of the Tides from the Theory of Gravity: A Question which had been given out the former Year, without receiving any Solution. He had only ten Days to draw this Paper up in, and could not find Leisure to transcribe a fair Copy; so that the *Paris* Edition of it is incorrect. He afterwards revised the whole, and inserted it in his Treatise of Fluxions; as he did also the Substance of the former Piece. These with the Treatise of Fluxions, and the Pieces printed in the *Philosophical Transactions*, of which we have given a List, are all the Writings which our Author lived to publish. Since his Death, two Volumes more have appeared, his Algebra, and his Account of Sir *Isaac Newton*’s Philosophical Discoveries. His Algebra, though not finished by himself, is yet allowed to be excellent in its Kind; containing, in one large Volume 8vo. a compleat elementary Treatise of that Science, as far as it has hitherto been carried. His Account of Sir *Isaac Newton*’s Philosophy was occasioned in this Manner: Sir *Isaac* dying in the Beginning of the Year 1728, his Nephew, Mr. *Conduitt*, proposed to publish an Account of his Life, and desired Mr. *Maclaurin*’s Assistance. The latter, out of Gratitude to his great Benefactor, chearfully undertook; and soon finished, the History of the Progress which Philosophy had made before Sir *Isaac*’s Time: And this was the first Draught of the Work in Hand, which not going forward, on Account of Mr. *Conduitt*’s Death,

was returned to Mr. *Maclaurin*. To this he afterwards made great Additions, and left it in the State in which it now appears. His main Design seems to have been to explain only those Parts of Sir *Isaac*'s Philosophy which have been, and still are, controverted: And this is supposed to be the Reason, why his grand Discoveries concerning Light and Colours are but transiently and generally touched upon. For it is known, that ever since the Experiments on which his Doctrine of Light and Colours is founded, have been repeated with due Care, this Doctrine has not been contested: Whereas his accounting for the celestial Motions, and the other great Appearances of Nature, from Gravity, is Misunderstood, and even ridiculed to this Day. The weak Charge of occult Qualities has been frequently repeated; foreign Professors still amuse themselves with imaginary Triumphs; and even the polite and ingenious Cardinal *de Polignac*, has been seduced to lend them the Harmony of his Numbers.

To the latter of these Works is prefixed, *An Account of the Life and Writings of Mr. Maclaurin*: From which, as it is very authentic, we have taken the Substance of the present Memoir.

In 1745, having been very active in fortifying the City of *Edinburgh* against the rebel Army, he was obliged to fly from thence to the North of *England*; where he was invited by Dr. *Herring*, then Archbishop of *York*, to reside with him, during his Stay in this Country. "Here, says he, in a Letter to one of his Friends, I live as happily as a Man can do, who is ignorant of the State of his Family, and who sees the Ruin of his Country." In this Expedition, however, being exposed to Cold and Hardships, and naturally of a weak and tender Constitution, he laid the Foundation of an Illness, which put an End to his Life. It was a Dropsy in the Belly, and he died of it on *June* 14, 1746, aged forty-eight Years. There is a Circumstance recorded of him during his last Moments, which shews him to have possessed great philosophic Serenity and Strength of Reason: And this was desiring his Friend, Dr. *Monro*, to Account for a Phænomenon he then observed in himself, viz. "Flashes of Fire seeming to dart from his Eyes, while in the mean Time his Sight was failing, so that he could scarce distinguish one Object from another."

The Life of PETER the GREAT. 549

Mr. *Maclaurin* lived a Bathelor to the Year 1733; but being very much formed for Society, as well as Contemplation, he then married *Anne*, the Daughter of Mr. *Walter Stewart*, Solicitor-general to his late Majesty for *Scotland*. By this Lady he had seven Children, of which, two Sons and three Daughters, together with his Wife, survived him.

The LIFE of PETER the GREAT, CZAR of MUSCOVY.

PETER the GREAT, so justly celebrated for his mechanical, mathematical, and philosophical Knowledge, was born the 30th of *May*, 1672, and was the Son of the Czar *Alexis Michaelowitz* by a second Wife. *Alexis* dying, in 1676, *Theodore*, his eldest Son by his first Wife, succeeded to the Throne, and died in 1682. *Peter* was then, though but ten Years of Age, proclaimed Czar, to the Exclusion of *John*, his elder Brother, who was of a weak Body, and weaker Mind.

—— The *Russian* Education was, at that Time, like the Country, illiberal and barbarous, so that he could derive no Advantages from thence. But, notwithstanding, he very early discovered a Strength of Genius superior to Difficulties, and an Abhorrence of those Pleasures which tend to enervate and deprave the Mind. And, to improve himself in the most useful Arts and Sciences, he visited the Courts of many other Kingdoms and States of *Europe*; the *Royal Academy of Sciences* at *Paris*; the Universities of *England*, *Denmark*, &c. and, by his indefatigable Diligence in acquiring political and scientific Knowledge, laid a Foundation for those high Atchievements in military and naval Affairs, and for those remarkable Improvements and Regulations in the Government of his Empire, as rendered him the Admiration of all *Europe*, and justly merited the Title of PETER the GREAT.

It would be endless to enumerate all the various Establishments for which the *Russians* are indebted to this great Emperor; *Fontenelle*

tenelle has recorded some of the principal, which also claim a Place here.

He established, 1. A Body of 100,000 Foot, under as regular a Discipline as any in *Europe*. 2. A Navy of 40 Ships of the Line, and 200 Gallies. 3. Fortifications in all main Towns, and an excellent Civil Government in the great Cities, which before were as dangerous in the Night, as the most unfrequented Deserts. 4. An Academy for Naval Affairs and Navigation, where all the Nobility are obliged to send some of their Children. 5. Colleges at *Moscow*, *Petersburg*, and *Kiof*, for Languages, polite Literature, and Mathematics; and Schools in the Villages, where the Children of the Peasants are taught to read and write. 6. A College of Physicians; and a noble Dispensatory at *Moscow*, which furnishes Medicines to the great Cities, and to the Armies; whereas before, there was no Physician but the Czar's, and no Apothecary in all his Dominions. 7. Public Lectures in Anatomy, a Word never heard before in *Russia*. Mr. *Voltaire* relates, that the Czar had studied this Branch of Knowledge under the celebrated *Ruyfch* at *Amsterdam*, and made such Improvements under this Master, as to perform even chirurgical Operations himself. He afterwards purchased the Cabinet of that Anatomist, which contained an immense Collection of the most curious, instructive, and uncommon Preparations. 8. An Observatory, not only for the Use of Astronomers, but as a Repository for natural Curiosities. 9. A Physic Garden, to be stocked with Plants, not only from all Parts of *Europe*, but from *Asia*, *Persia*, and even the distant Parts of *China*. 10. Printing-houses, where he abolished their old barbarous Characters, which, through the great Number of Abbreviations, were almost become unintelligible. 11. Interpreters for all the Languages of *Europe*; and likewise for the *Latin*, *Greek*, *Turkish*, *Calmuck*, *Mogul*, and *Chinese*. 12. A Royal Library, composed of three very large ones. which he purchased in *England*, *Holstein*, and *Germany*.

These, and many more, were particular Institutions and Establishments: But the Czar made general Reformatations, to which indeed the other were only subservient. He changed the Architecture, which was ugly and deformed; or, to speak more properly, he first introduced that Science into his Dominions. He
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sent for a great Number of Pictures from *Italy* and *France*, and by this Means instructed in the Art of Painting a People, who knew no more of it, than what they could collect from the wretched Daubing of their Saints Painters. He sent Ships laden with Merchandize to *Genoa* and *Leghorn*, which returned freighted with Marble and Statues: And Pope *Clement XI.* pleased with his Taste, presented him with a fine Antique, which the Czar, not caring to trust by Sea, ordered to be brought to *Petersburg* by Land. Religion was not neglected in this general Reform: Ignorance and Superstition had over-run it so much, that it scarcely merited the Name of Christian. The Czar introduced Knowledge where it was miserably wanted; and this Knowledge enabled him to abolish Fasts, Miracles, and Saint-worship, in a good Degree, at least. He ventured further than to the Correction of Rites: He abolished the Patriarchate, though pretty much independent on him; and by that Means got rid of a Power, which was always interrupting and disconcerting his Measures. He took away Part of the Revenues of those Churches and Monasteries, which he thought too wealthy; and leaving only what was necessary for their Subsistence, added the Overplus to his own Demesnes. He made many judicious and useful ecclesiastical Canons, and ordered preaching in the *Russian* Language. Lastly, he established a general Liberty of Conscience throughout his Dominions; and, if we had no other Proof of his civilized Spirit, this would be sufficient. There is one more Reformation, and perhaps as necessary and useful as any of the former, which he made even in his last Illness, though it was exceedingly painful. When the Senators and great Personages, then about him, mentioned the various Obligations which *Russia* lay under to him, for abolishing Ignorance and Barbarism, and introducing Arts and Sciences, he told them, that he had forgot to reform one of the most important Points of all, *viz.* the male Administration of Justice, occasioned by the tedious and litigious Chicanery of the Lawyers; and signed an Order from his Bed, limiting the Determination of all Causes to eleven Days, which was immediately sent to all the Courts of his Empire.

This wonderful Person died of the Strangury, caused by an Imposthume in the Neck of his Bladder, on the 28th of *January*,

ary, 1725, aged 53 Years. He was tall, and remarkably well shaped: He had a noble Countenance, Eyes sparkling with Vivacity, and a robust Constitution. His Judgment was sound, which, as *Voltaire* has observed, may justly be deemed the Foundation of all real Abilities: And to this Solidity was joined an active Disposition, which put him upon the most arduous Undertakings. Whoever reflects upon the Interruptions, Difficulties and Oppositions, that must unavoidably occur in civilizing and reforming a large and barbarous Empire, must suppose the Czar to have been, as indeed he really was, a Person of the greatest Firmness and Perseverance.

Animated by the laudible Ambition of supporting the Dignity, and answering the Ends of Government; and it was happy for him, that this Ambition was equalled by his distinguished Talents, improved by every Advantage he could possibly procure, and rewarded not only with public Applause, but by (that which infinitely exceeds it) the Satisfaction, and Tranquility of his own Mind.

The Czar wrote several Pieces upon Naval Affairs, and other occasional Tracts, so that his Name is justly added to the short Catalogue of Sovereigns who have honoured the Public with their Writings.

The Czarina, his Widow, whom he nominated his Successor, was, upon his Death, immediately acknowledged Empress of *Russia* by the several Estates thereof. The History of this Lady is curious and extraordinary, and therefore we shall give the following concise Memoir of her from Mr. *Voltaire's* History of *Peter*, tho' it may be thought a Digression, viz. "The Lenity of this Princess, says he, has been carried to a Degree unparalleled in the History of any Nation. She had promised, that during her Reign no Body should be put to Death; and she has kept her Word. She is the first Sovereign that ever shewed this Regard to the Human Species. Malefactors are now condemned to serve in the Mines and other public Works; a Regulation, not less prudent than humane, since it renders their Punishment of some Advantage to the State. In other Countries, they only know how to put a Malefactor to Death, with the Apparatus of an Executioner, but are not able to prevent the Commission of Crimes."

The LIFE of BENJAMIN ROBINS.

MR. *Robins* was born at *Bath*, in 1707. As his Parents were not wealthy, and also Quakers, it was much feared, lest the surprizing Progress he had by himself early made in various Branches of Literature, would be interrupted through Want of due Encouragement; especially amongst a People, who profess not the same Esteem, as the rest of the World, for the Learning they style Human; supposing it not requisite either to the Understanding or explaining divine Subjects.

However, some particular Friends of Mr. *Robins* being very desirous that he might continue his Pursuits, and his Merit not be lost in Obscurity; wished for this Purpose, that he could be properly recommended to teach in this Town the Mathematics, which had been one of the principal Objects of his Studies. With this View therefore they communicated to a Gentleman here a Paper written by him, in order to learn what Judgment Persons of Knowledge might make of his Abilities. This was shewn to Dr. *Pemberton*, who, thence conceiving a good Opinion of the Writer, for a farther Trial of his Proficiency sent him some Problems, of which the Doctor required elegant Solutions, not those founded on Algebraical Calculations; adding an Example of such a Solution, that the young Geometer might the more readily comprehend his Meaning. An Answer was returned by Mr. *Robins*, that gave a very advantageous Idea of his Taste, as well as Invention.

Upon this he came to *London*; where his Presence still increased the favourable Sentiments that had been entertained of his Talents. For besides his Acquaintance with divers Parts of Learning, there was in him to an ingenuous Aspect, joined an Activity of Temper, together with a great Facility in expressing his Thoughts with Clearness, Brevity, Strength and Elegance; Endowments, which do not always accompany studious Persons. But though Mr. *Robins* was possessed of much more Skill than is usually required in a common Teacher; yet being very young, it was thought proper, that he should employ some Time in perusing the best Writers on the sublimer Parts of the

Mathematics, before he undertook publicly the Instruction of others. In this Interval, besides improving himself in the modern Languages, he had Opportunities of reading, in particular, the Works of *Apollonius*, *Archimedes*, *Fermat*, *Huygens*, *De Wit*, *Slusius*, *James Gregory*, *Dr. Barrow*, *Sir Isaac Newton*, *Dr. Taylor*, and *Mr. Cotes*. These Authors he readily understood without any Assistance; of which he gave frequent Proofs to his Friends. Amongst others, one was a Demonstration of the last Proposition of *Sir Isaac Newton's* Treatise on Quadratures, which was thought not undeserving a Place in the *Philosophical Transactions*.

Not long after, an Occasion offered for him to exhibit to the Public a Specimen also of his Knowledge in natural Philosophy. The *Royal Academy of Sciences* at *Paris* had proposed, amongst their Prize Questions, to demonstrate the Laws of Motion in Bodies impinging on one another. The celebrated *M. John Bernoulli* here condescended to be a Candidate; and though his Dissertation lost the Reward, he appealed to the learned World by printing it. He therein endeavoured to establish *M. Leibnitz's* Opinion of the Force of Bodies in Motion, from the Effects of their striking against springing Materials; as *Signor Poleni* had before attempted to evince the same Thing from Experiments of Bodies falling on soft and yielding Substances. But as the Insufficiency of *Signor Poleni's* Arguments had formerly been demonstrated; so *Mr. Robins* published in a *Journal*, called *The present State of the Republic of Letters*, an unanswerable Confutation of *M. Bernoulli's* Performance.

It may indeed seem strange, that a mere Tyro should thus overcome so redoubted a Veteran. But though *M. Bernoulli* must be allowed to have had a considerable Share of Invention in pure Mathematics; yet, when any physical Cause intervened, he seldom could avoid false Reasonings; being deficient in that Distinctness of Conception, so necessary for securing against Error in these more complex Subjects, and which was possessed by *Mr. Robins* in a supreme Degree.

Now the Recommendations of his Friends, supported by such authentic Testimonies of his Abilities, soon procured him many Scholars; amongst these, several were of real Genius, who at present make an eminent Figure in public Affairs.

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But it may be here observed, that about this Time he quitted the peculiar Garb and Profession of a Quaker; for not having the least Tincture of Obstinacy, Superstition or Enthusiasm in his Nature; he soon got over the Prejudices of Education, and had an utter Aversion to act a feigned Part. However, he continued to cultivate a Friendship with several deserving Persons of that Persuasion; not being ignorant that at all Times, and in all Places, there have been great Numbers of Learning, Sagacity, and even Honesty too, who through the Force of early Impressions and a certain Cast of Temper, have made most palpable Absurdities the Objects of their Faith.

Mr. *Robins's* Way of instructing was generally similar to the Course he had followed himself; but as he only taught Persons singly, and not in Classes, it was in his Power to vary his Method according to the Capacity or Intention of each Learner. However, he always began with the Elements of *Euclid*, not as interpolated by *Campanus* and *Clavius*, or anatomised by *Herigone* and *Barrow*, or depraved by *Tacquet* and *Dechalles*; but according to the Original handed down to us by Antiquity; much less did he use any of the new modelled Elements, that at present every where abound.

By what is here said, I would not be understood to dissuade the consulting *Clavius's Euclid* at a proper Time; for as in it there is nothing inconsistent with the Strictness of Demonstration, so it contains many curious Particulars relating to Geometry. And indeed the contracted Form, into which Dr. *Barrow* has reduced the Elements, may be of Use for refreshing the Memory, after the Original has been well considered; the same Judgment may be passed on his *Archimedes*, *Apollonius*, and *Theodosius*.

For want of such a Beginning in his Studies, many a Mathematician, who has acquired no small Fame, has been altogether incapable of framing a synthetic Demonstration; as it ought to be, or even of readily comprehending one so constituted; but would be apt, though it had all the Perfections possible, to imagine it tedious and obscure, through his not being acquainted with the genuine Expression of the true Geometry. Hence the Writings of great Part of the Moderns on mathematical Subjects abound with inartificial Computations. The

Consideration of which led Mr. *Robins* often to repeat a Saying of that elegant Writer *Joannes della Faille*: *Mathematica multi sciunt, mathesis pauci.*

Amongst Mr. *Robins*'s Scholars, such as went afterwards to *Cambridge*, in order to qualify themselves for one of the learned Professions, were wont, as is the Custom of young Men, frequently to enter into warm Contests with the Disciples of Mr. Professor *Saunderson*, that Gentleman using there a very different Method of Instruction. And indeed I have met with ingenious Persons, who, though they allowed *Euclid*'s Elements to be the perfectest Book of the Kind; yet did not think it the most proper Introduction for the Generality of Students, at least when ranged in Classes, the Way of teaching principally followed in Universities; but the Contrary of this Opinion appears to be true from the constant and very successful Practice of the late famous Mr. *Maclaurin*, who, I observed with Pleasure, always begun his academical Courses with the Elements of *Euclid*.

And these Elements well deserve to be carefully considered even by such as do not intend to devote much of their Time to mathematical Speculations; for they are more useful, in order to acquire a Habit of strict Reasoning, than the most laboured Systems of Logic: That Art owing, in great Measure, its Original, and indeed being best fitted for making formal Answers, to the childish and ridiculous Conceits of those quibbling Sophists, whose Impertinence *Plato* has so justly exposed; appears so far from being the most natural Means of discovering and judging of Truth, that the great Master of the Art itself was a very bad Reasoner.

The two chief Grounds of false Reasoning are Ambiguity in the Use of Words and Principles hastily taken up; scarce any one ever offending against the Rules of Mode and Figure in Syllogisms. But the surest Defence against these two Grounds of Error, is exercising the Mind in Subjects, where a Course of Reasoning is followed free from Perplexity in the Terms, and disintangled from Uncertainty in the Principles; by which we may gain a Habit of distinguishing between perfect Reasoning, and whatever, in different Degrees, takes only the Appearance of it.

Euclid, in his Elements, has the Advantage of a Subject, the Simplicity of which keeps it almost necessarily free from any Ambiguity of Terms, and his Demonstrations are conducted with the most express Design of reducing the Principles assumed to the fewest Number and most evident, that might be; and in a Method the most natural, as it is the most conducive towards a just and compleat Comprehension of the Subject, by beginning with such Particulars, as are most easily conceived, and flow most readily from the Principles laid down, thence by gradually proceeding to such as are more obscure, and require a longer Chain of Argument.

And this great Regard to Perspicuity in the Method and Form of Reasoning was so peculiarly the Characteristic of the most ancient Geometers, that Mr. *Robins* chose to initiate those under his Instruction in the Elements of the Conics by *Apolonius* in Preference to any modern Author.

As to the Principles of Algebra, Mr. *Robins* used to deliver short Precepts of his own, free from the Intricacies and Misconceptions, by which the Generality of Writers had obscured a Matter in itself very plain and easy to be comprehended. The interpreting the Terms of Affirmative and Negative, which, in reality, expressed only the Relation of one Quantity to another, as implying some absolute Quality in the Quantities to which they are prefixed, has occasioned all that Air of Mystery, by which Learners are so unnecessarily perplexed.

Mr. *Robins* explained the Doctrine of Fluxions, and what is usually styled the sublime Geometry, after a clear and genuine Manner; not having the least Recourse to the absurd Notion of Indivisibles or Infinitesimals, but as it is delivered truly, though very briefly, by its great Inventor in the Introduction to his admirable Treatise on Quadratures.

I shall not proceed to describe Mr. *Robins*'s Way of instructing in the several Branches of mixt Mathematics; whereof he was a most perfect Master, and on which he could deliver himself with the utmost Clearness. I shall only observe, that as he well grounded his Scholars in true Geometry; it was easy for him to inform them of the practical Parts in a more scientific Manner, than they are handled in the vulgar Treatises.

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The modern Authors, Mr. *Robins* chiefly valued, were such as approached the nearest, in their Manner of Writing, to that of the Ancients. Amongst these the great *Huygens* stands in the first Place. But those, who had the Care of publishing his posthumous Works, seem to have been of a different Opinion, when they tell us, they once had Thoughts of changing his real Demonstrations into Algebraical Calculations!

Mr. *Robins* also had the highest Esteem for Dr. *Barrow's* Lectures, and recommended them usually to his Scholars; for in those, that treat of the Mathematics in general, they would find amongst other excellent Things concerning the Nature and Principles of the Science, a just Defence of *Euclid*, and a full Explanation of his Idea of Proportionality; and as the Subject is handled in a popular Manner, so the Author, besides shewing much real Learning and exquisite Choice in his Authorities, has not only supported his peculiar Sentiments with great Subtilty of Reason, but also adorned his Discourse by a masculine and true Eloquence.

In his optical Lectures they would see the Principles of Catoptricks and Dioptricks set forth in the compleatest Manner. There the actual Intersections are determined, which the Rays of Light, issuing from any Point of an Object after Reflection or Refraction, make with each other, as also the Limits of those Intersections, and how the Rays, the nearer they approach those Limits, are more and more conspited; whence such Limits are called the Foci, as the Line passing through them all has been since named the Cautic. Next the Author finds the principal Foci in different Lens's. Afterwards he treats, in general, of the apparent Magnitudes of Objects, and then particularly assigns the Images of plane Surfaces. The whole is intermixed with several curious Propositions in Geometry, and confirmed by most accurate Demonstrations, which have been praised as such by Sir *Isaac Newton* himself; who supposes his Auditors well acquainted with these Lectures of his Predecessor, in order to understand perfectly the sublime Discoveries, he was delivering to them.

I need not mention Mr. *Robins's* Opinion of Sir *Isaac Newton*, since he has had Occasion to declare it so often in several Tracts he wrote. And, indeed, Sir *Isaac Newton's* Fame seems at present

sent to have surmounted all Opposition. The Philosophers of a neighbouring Nation acknowledge his Merit. Though they had for Years quite overlooked his Book of Optics; yet now they speak of it in the highest Terms. And they have at length adopted Attraction under the Name of universal Gravitation; which they had long rejected as an occult Quality, on Account its Cause is not discovered. They might as well have neglected the Consideration of the Laws of Motion; because it is not known, why Motion arises from the Collision of Bodies; or the Contemplation of the Effects of Light, as it has not been found out, whether it is owing to Beams darted immediately from the luminous Object, or to Impressions made on a surrounding Medium, or to some more latent Cause. It is the Business of the true Philosophy to explore the most simple Causes, and from their Combinations to account for the various Phænomena in Nature. But all the Objections that could be raised against this true Way of Philosophizing, Sir *Isaac Newton* had previously obviated in his Works. Of this, they seem, at last, to be sensible, from having considered them more attentively; and accordingly they are attempting to make Improvements on his Principles.

And here I cannot help declaring the Satisfaction Mr. *Robins* always expressed on observing the Progress a true Taste for real Geometry made in *Scotland*. The mathematical Sciences have indeed been well cultivated by that learned Nation. To a *Scotchman*, the Lord *Napier*, we are beholden not only for the admirable Invention of Logarithms, and their Application to Trigonometry, but also for other very valuable Improvements he has made in that most useful Art, and probably his ill State of Health hindered his making farther Discoveries. The incomparable *James Gregory* was likewise of that Country, whose rising Merit seems to have given Umbrage even to the great *Huygens*; and whose immature Death was an irreparable Loss to the mathematical World; for which Loss, I have been informed, Sir *Isaac Newton* used always to shew very sensible Tokens of Grief, whenever Mr. *Gregory's* Name happened to be mentioned to him.

In the Manner above recommended, were Mr. *Robins's* younger Days employed in promoting the Knowledge of these
Science;

Sciences ; whose Aid is in some Measure required for establishing even the first Foundations of civil Society ; as the Property of each Individual of the Community must be ascertained in Number, Measure, and Weight.

Mr. *Robins* printed, in the Year 1742, a small Treatise, entitled *New Principles of Gunnery*, containing the Result of many Experiments he had made, whereby is discovered the Force of Gunpowder, and the Difference in the resisting Power of the Air to swift and slow Motions ; whence it plainly appeared, that the Opposition of that Medium to Bullets and Shells, shot from Cannon and Mortars, far exceeded, what was generally imagined ; and that the Tract described in their Motion, differed from that of a parabolic Line to a Degree undiscovered by any, who had written expressly on the Subject from the Days of the famous *Galileo* to the present Time.

Sir *Isaac Newton* indeed, as Mr. *Robins* observed, was very sensible of the Effects of this Resistance ; and has proposed how to assign, in particular Cases, a Curve of a different Species from the Parabola, as more answerable to the Projectile's Motion. Nor was this great Man wholly unapprised of the Increase of Resistance both from the rotary Motion of the moving Body, and also from the Pressure of the Fluid on the Body, becoming, by its Motion, greater on the fore Part than on the Hinder.

The Tract of Mr. *Robins* was preceded by an Account of the Progress modern Fortification had made from its first rise ; as also of the Invention of Gunpowder, and of what had already been performed in the Theory of Gunnery.

This was well received by the Public, and, it was thought, would have procured the Author Preferment, if he never had been Secretary to the secret Committee.

As Mr. *Robins's* Experiments and Theories met with the greatest Approbation from the best Judges here ; so the Tract he had published did him much Honour abroad ; for the famous M. *Euler* translated it into *High Dutch* ; accompanying this small Piece with an immense Commentary ; and bestowing Praises on it, yet not without attempting to discover Errors. This was printed at *Berlin* in 1745, and Mr. *Robins* soon after declared, that M. *Euler's* principal Objections arose from
 Mistakes ;

Mistakes; the Source of which having found out, he intended to publish an Answer; but from that Time continual Interruptions prevented him.

It has also been translated into *French* by M. *Le Roy*; and it is often mentioned with Applause in the Literary Journals of *Europe*.

The Reputation, he justly acquired by this Performance, made a foreign Professor of the Mathematicks, when in *London*, pay him a Visit; and his Esteem for Mr. *Robins* was by that Interview greatly improved, insomuch that on his Return home, he commended Mr. *Robins* so effectually to the late Prince of *Orange*, that he was invited over to assist in the Defence of *Bergen-op-Zoom*, then invested by the *French*; and he did accordingly set out for that Place; but it was entered by the Besiegers, September 16, 1747, just after his Arrival in the *Dutch Army*.

Some Years after this Disappointment, Mr. *Robins* had the good Fortune to be engaged in a Work, that proved of more Consequence to him, than all he had hitherto written.

In 1741, Mr. *Anson*, (late Lord *Anson*, and at the Head of the Admiralty, when our Fleets carried Terror, wherever they appeared) as Commodore in the *Centurion* Man of War, accompanied with other Ships, began his Voyage round the World, which though by Disasters had not all the Success, that might have been reasonably expected; yet under this great Commander were produced many brave and skilful Officers, who at present do so much Honour to the *British Navy*. Of this Voyage the Public had for some Time been in Expectation of seeing an Account composed under his Lordship's own Inspection. For this Purpose the Reverend Mr. *Richard Walter* was employed, as having been Chaplain aboard the *Centurion* for the greatest Part of the Expedition. Mr. *Walter* had accordingly almost finished his Task, having brought it down to his own Departure from *Macao* for *England*; when he proposed to print his Work by Subscription. Then Mr. *Robins* being recommended as a proper Person for reviewing it; on examination (notwithstanding the Shortness of the Time, that could be allowed for such an Undertaking) it was resolved, that the whole should be written

entirely by Mr. *Robins*; what Mr. *Walter* had done being, as Mr. *Robins* informed me, almost all taken *verbatim* from the *Journals*, was to serve as Materials only. And upon a strict Perusal of both the Performances, I find Mr. *Robins*'s to contain about as much Matter again as that of Mr. *Walter*'s; and indeed the Introduction entire, with many Dissertations in the Body of the Book, were composed by Mr. *Robins*, without having received the least Hint from Mr. *Walter*'s Manuscript; and what he had thence transcribed regarded chiefly the Wind and the Weather, the Currents, Courses, Bearings, Distances, Offings, Soundings, Moorings, and the Qualities of the Ground they anchored on, with such Particulars, as generally fill up a Sailor's Account. So this famous Voyage was composed in the Person of the *Centurion*'s Chaplain by Mr. *Robins* in his own Style and Manner. Of this Mr. *Robins*'s Friends Mr. *Glover* and Mr. *Ockenden* are Witnesses as well as myself, we having compared the printed Book with Mr. *Walter*'s Manuscript.

And this was at that Time no Secret, for in the Counterpart of an Indenture now lying before me, made between *Benjamin Robins*, Esq; and *John* and *Paul Knapton*, Booksellers, I find, that those Booksellers purchased the Copy of this Book from Mr. *Robins* as the sole Proprietor, with no other mention of Mr. *Walter*, than a Proviso in relation to the Subscriptions he had taken.

Thus as many of Mr. *Robins*'s smaller Pieces came abroad without a Name; so this larger Volume was printed in the Year 1748, under that of another. But though Mr. *Walter* appears in the Frontispiece; yet Mr. *Robins* was so well understood here to be the principal Author, that he was universally congratulated on its Success. And indeed no Production of this Kind ever met with a more favourable Reception from the Public; four large Editions were sold off in less than a Twelve-month; and it has been translated into most of the Languages of *Europe*; and it still supports its Reputation, it being, in the Year 1761, printed here for the ninth Time.

Henceforward Mr. *Robins* had Opportunities of making farther Experiments in Gunnery, by the Favour of Lord *Anson*; the Result of some of them is declared in some Discourses that
have

have been published, from the Author's Papers, by *James Wilson*, M. D.*

He also not a little contributed to the Improvements made in the *Royal Observatory at Greenwich*, by using his Interest with the same noble Person to procure a second Mural Quadrant, and other Instruments, whereby this Observatory is become, perhaps, the compleatest of any in the World. The new Mural Quadrant, which was at first designed for observing towards the North, being still of more exquisite Workmanship than the former, is accommodated for Observations towards the South. This Observatory soon became famous from Mr. *Flamsteed's* Observations being found to be the most accurate of any made at that Time by others.

Mr. *Robins's* Reputation being now arrived at its full Height, neither his Backwardness in pushing his Fortune, that constantly accompanied him, nor his inflexible Honesty, that never permitted him to approve of the unwarrantable Actions of any Faction, being no longer able to prevent his Preferment, he was offered the Choice of two very considerable Employments. The first was to go to *Paris* as one of the Commissaries for adjusting our Limits in *Acadia*; the other to be Engineer General to the *East-India* Company; whose Forts being in a most ruinous Condition, there was wanting a very capable Person to put them into a proper Posture of Defence. This latter he accepted, as it was suitable to his Genius, and where, he believed, he should be able to do real Service, as not being liable to be hindered through the Suggestions of Design or Ignorance, which by their Boasting and Importunity, often insinuating themselves into the Direction of public Affairs, frequently render abortive the best concerted Schemes.

The Company's Terms were both advantageous and honourable: There was settled upon him 500 *l. per Annum* during his Life; on Condition that he continued in their Service five Years. He was also entrusted with the Appointment of all that were to be employed under him; and such an Order was made for furnishing him with what Sums of Money he should think neces-

* This whole Life is extracted from Dr. *Wilson's* Account of Mr. *Robins* prefixed to the two Volumes of his Tracts, and that *verbatim*, except here and there a Sentence.

fary towards carrying on the Works he undertook, as was never passed on the like Occasion; so great was the Confidence the Company reposed in Mr. *Robins's* Integrity as well as Ability; in neither of which did they find themselves deceived; and, indeed, he acted in all Occurrences, through every Scene of Life, with the utmost Generosity and disinterestedness; and never offered to undertake any Thing, whereof he was not a perfect Master.

He designed, if he had remained in *England*, to have composed a second Part of the Voyage round the World; as appears from the following Letter, which Lord *Anson* did Mr. *Robins* the Honour to write to him on that Subject.

DEAR SIR,

When I last saw you in Town I forgot to ask you, whether you intended to publish the second Volume of my Voyage before you leave us, which I confess, I am very sorry for. If you should have laid aside all Thoughts of favouring the World with more of your Works, it will be much disappointed, and no one in it more than

Bath, the 22d
of October,

Your very much obliged

Humble Servant,

1749.

ANSON.

If you can tell the Time of your Departure, let me know it.

The above Letter was printed not without the noble Lord's Consent; who, being requested to permit, that this Testimony might be exhibited to the World of his Lordship's Esteem for Mr. *Robins*, replied in the politest Manner, *That every Thing in his Power was due to the Memory of one, who had deserved so well of the Public.*

Mr. *Robins* was also preparing an enlarged Edition of his *New Principles of Gunnery*, and as there would have been made great Improvements in what was already published; so the geometrical Part was intended to be added,* as is learnt from some Memorandums, he left behind him. From them, also, is understood, that he had the Theory of the Moon under Consideration.

But,

* See a Geometrical Demonstration of all the Propositions in this Treatise of GUNNERY in our INSTITUTIONS from Page 2027 to 3138, which was drawn up soon after that Book was published.

But, having provided himself with a compleat Set of astronomical and other Instruments for making Observations and Experiments in the *Indies*, he departed from hence at *Christmas* in the Year 1749, to the great Sorrow of all his Acquaintance. This however was, in some Measure, alleviated, on Account of the Benefits the Public might receive from his present Situation in Life, and by the Hopes of seeing him return safe with Honour to his native Country. Not less sensibly moved was Mr. *Robins* at quitting the agreeable Society of his dear Friends, to many of whom he had been strictly united from his first coming to this Place.

In the Voyage, his Ship was very near being cast away ; but he arrived at the *Indies* on the 13th of *July* 1750.

There he immediately set about his proper Business with unwearied Diligence ; and he compleatly formed Plans for *Fort St. David* and *Madras*. But he lived not to put these in Execution. For the great Difference in the Climate was beyond his Constitution to support ; which was always delicate, though till then, he scarce ever had a Fit of Sickness.

In *September*, 1750, he was attacked by a Fever, out of which he recovered ; but about eight Months after he fell into a languishing Condition, in which State he continued to his Death. When he had Reason to believe, that was not far off, he expressed himself displeased the Physicians had not made him acquainted with his real Case sooner, that he might have lost no Time in Expectation of recovering ; and even then he exerted himself as much as possible in the Duty of his Office, expiring at *Fort St. David* the 29th of *July*, 1751, with his Pen in his Hand, as he was drawing up, for the Company, an Account of the Posture of their Affairs.

This Account of *Mr. Robins* is given us by his Friend Dr. *Wilson* ; but it is always deemed equitable to hear both Sides, in Cases where very different Characters are given of the same Person ; for this Purpose the Reader is referred to the Polemical Tracts between Mr. *Robins* and Professor EULER, BERNOULLI, and others abroad ; and Dr. JURIN, Dr. SMITH, &c. at home, for his unprejudiced Opinion of this Writer.



INDEX.

A

<i>AGrippa, Henry Cornel.</i>	p. 158
<i>Albategni</i>	124
<i>Albertus Magnus</i>	126
<i>Albumazar</i>	123
<i>Anaxagoras</i>	7
<i>Amontons, William</i>	476
<i>Apollonius</i>	72
<i>Aristarchus</i>	73
<i>Aristotle</i>	29
<i>Avicenna</i>	124

B

<i>Bacon, Sir Francis</i>	222
<i>—, Roger</i>	126
<i>Bainbridge, John</i>	281
<i>Barrow, Isaac</i>	342
<i>Bayer, John</i>	279
<i>Bernoulli, James</i>	422
<i>Bianchini, Signor</i>	522
<i>Blagrove, John</i>	305
<i>Blondel, Francis</i>	306
<i>Boerhaave, Herman</i>	478
<i>Borelli, John Alphonse</i>	308
<i>Boyle, Hon. Robert</i>	393
<i>Brabe, Tycho</i>	178
<i>Branker, Thomas</i>	431
<i>Briggs, Henry</i>	234
<i>Brerewood, Edward</i>	251
<i>Brounker, William, Lord</i>	337
<i>Bulialdus, Ismael</i>	287

C

<i>Carré, Lewis</i>	505
<i>Cartes, Rene des</i>	257
<i>Cassini, Johannes Dominicus</i>	301
<i>Celsus, Aurelius Cornelius</i>	102
<i>Chales, Claudius Francis De</i>	412
<i>Cherubin, Lepere</i>	292
<i>Cicero, Marcus Tullius</i>	88
<i>Clarke, Samuel</i>	461
<i>Clavius, Christopher</i>	220
<i>Cleomedes</i>	70
<i>Clerc, John De</i>	444

<i>Collins, John</i>	332
<i>Columbus, Christopher</i>	185
<i>Conon, of Samos,</i>	48
<i>Copernicus</i>	164
<i>Cotes, Roger</i>	512
<i>Cunitia, Maria</i>	298

D

<i>DEE, John</i>	213
<i>Democritus</i>	44
<i>Derham, William</i>	446
<i>Diophantes</i>	115
<i>Du Hamel, John Baptiste</i>	347

E

<i>EPicurus</i>	60
<i>Euclid, the Philosopher.</i>	47
<i>—, the Mathematician.</i>	57
<i>Eudoxus</i>	54

F

<i>FLamsteed, John</i>	377
<i>Fontinelle, Bernard de</i>	486
<i>Foster, Samuel</i>	269
<i>Freind, John</i>	483

G

<i>GAlileo</i>	237
<i>Gassendus, Peter</i>	263
<i>Gellibrand, Henry</i>	267
<i>Gesner, Conrade</i>	206
<i>Greaves, John</i>	295
<i>Gregory, James</i>	349
<i>—, David</i>	452
<i>Grew, Nehemiah</i>	411
<i>Gunter, Edmund</i>	251

H

<i>HAlley, Edmund</i>	432
<i>Harriott, Thomas</i>	309
<i>Hartsoeker, Nicholas</i>	531
<i>Hesse, William, Prince of</i>	248
<i>Hewelius, John</i>	291
<i>Hipparchus</i>	78
<i>Hire, Philip de la</i>	356
<i>Hobbes, Thomas</i>	243
<i>Hooke, Robert</i>	222

Horrox,

I N D E X.

<i>Horrox, Jeremiah</i>	—	271	<i>Peter the Great, Czar of Muscovy.</i>	549
<i>Hospital, Will. Franc. Anth.</i>	—	449	<i>Petit, Peter</i>	415
<i>Hudson, John</i>	—	450	<i>Pelly, Sir William</i>	406
<i>Huygens, Christian</i>	—	338	<i>Plato</i>	15
K			<i>Pliny the Elder</i>	104
<i>Keill, John</i>	—	457	<i>Porta, John Baptista</i>	221
<i>—, James</i>	—	460	<i>Proclus</i>	69
<i>Kepler, John</i>	—	214	<i>Ptolemy</i>	111
L			R	
<i>LAMY, Bernard</i>	—	417	<i>Ramus, Peter</i>	206
<i>Landbergius, Philip</i>	—	266	<i>Regiomontanus</i>	146
<i>Leibnitz, William De</i>	—	385	<i>Reyneau, Charles</i>	528
<i>Locke, John</i>	—	390	<i>Ricciolus, Johannes Baptista</i>	278
<i>Longinus</i>	—	119	<i>Robins, Benjamin</i>	553
<i>Longomontanus, Christianus</i>	—	200	<i>Robault, James</i>	416
<i>Lucretius</i>	—	87	<i>Rooke, Laurence</i>	311
M			S	
<i>Maclaurin, Colin</i>	—	542	<i>Savile, Sir Henry</i>	220
<i>Maginus, John Anthony</i>	—	211	<i>Saunderson, Nicholas</i>	516
<i>Manilius</i>	—	90	<i>Sauveur, Jos.</i>	418
<i>Maraldi, Monsieur</i>	—	540	<i>Scaliger, Jos.</i>	254
<i>Mæstlinus</i>	—	246	<i>Scheinerus, Christ.</i>	265
<i>Mead, Dr.</i>	—	508	<i>Schonerius, Johannes</i>	201
<i>Mercator, Nicholas</i>	—	359	<i>Sloane, Sir Hans</i>	487
<i>—, Gerrard</i>	—	213	<i>Snellius, Willibrordus</i>	280
<i>Molyneux, William</i>	—	426	<i>Sosigenes</i>	90
<i>Moore, Sir Jonas</i>	—	299	T	
<i>Munster, Sebastian</i>	—	202	<i>Tarrantius</i>	88
N			<i>Thales</i>	1
<i>Neper, John, Baron of Mar-</i>	—	231	<i>Theodostus</i>	85
<i>chiston</i>	—	231	<i>Theon</i>	117
<i>Newton, Sir Isaac</i>	—	361	<i>Theophrastus</i>	58
<i>Newton, John</i>	—	402	<i>Torricelli, Evangeliste</i>	413
<i>Nieuwentyt, Bernard</i>	—	421	V	
<i>Nonius, Peter</i>	—	202	<i>Varignon, Peter</i>	498
O			<i>Vespucius, Americus</i>	199
<i>Oldenburg, Henry</i>	—	409	<i>Virgil</i>	93
<i>Oughtred, William</i>	—	293	<i>Vieta, Francis</i>	247
<i>Ovid</i>	—	98	W	
<i>Ozanam, James</i>	—	353	<i>Wallice, John</i>	273
P			<i>Ward, Seth</i>	284
<i>Pappus</i>	—	122	<i>Whiston, William</i>	470
<i>Paracelsus</i>	—	205	<i>Wilkins, John</i>	289
<i>Pardies, Ignatius Gastin</i>	—	475	<i>Wren, Christopher</i>	313
<i>Parent, Anthony</i>	—	455	<i>Wright, Edward</i>	255
<i>Pascal, Blaise</i>	—	405	Z	
<i>Pell, John</i>	—	334	<i>ZENO</i>	81

